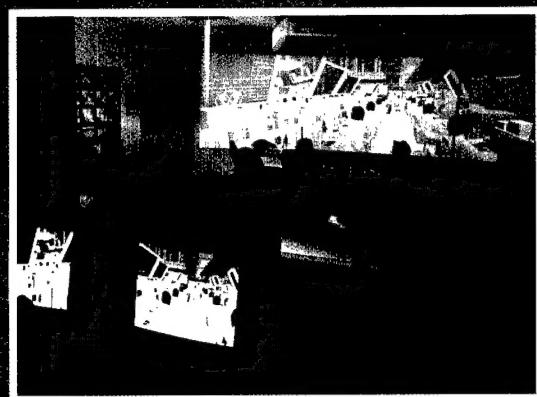
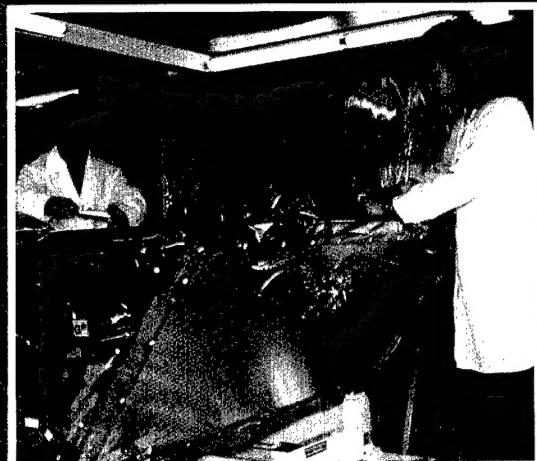
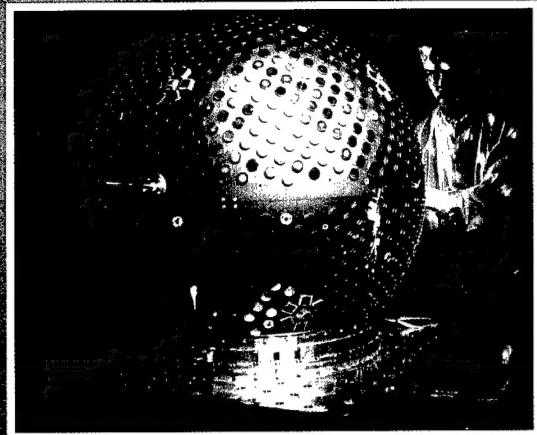
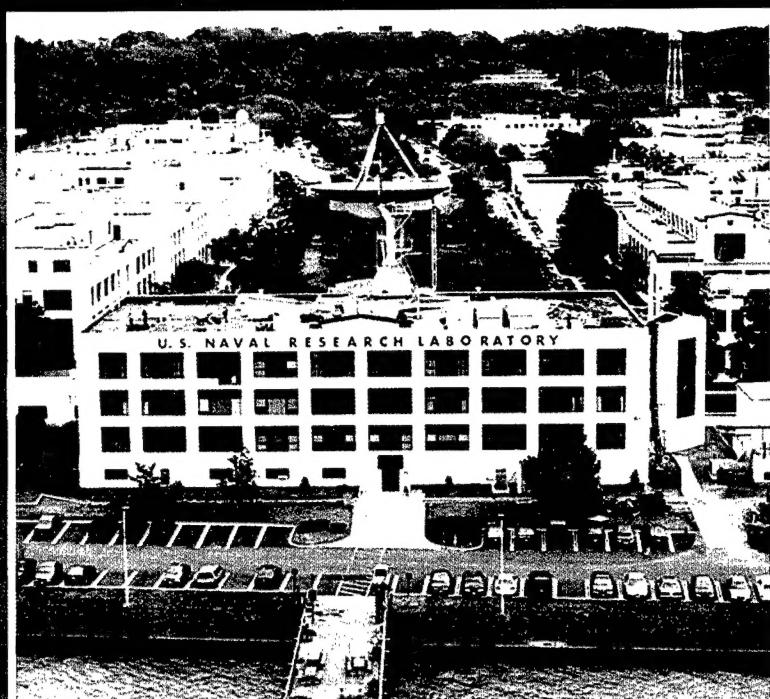


# Naval Research Laboratory

Washington, DC 20375-5320 NRL/PU/5211-01-420 November 2001



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# NRL FACT BOOK

20020215 114

The *NRL Fact Book* is a reference source for information about the Naval Research Laboratory (NRL). It is updated and placed on NRL's Web site (<http://www.nrl.navy.mil/>) annually. It is printed every other year. To provide additional information to the reader, a point of contact is listed for each activity.

NRL has a continuing need for physical scientists, mathematicians, engineers, and support personnel. Vacancies are filled without regard to age, race, creed, sex, or national origin. Information concerning current vacancies is furnished on request. Address all such inquiries to:

Human Resources Office  
Personnel Operations Branch (Code 1810)  
Naval Research Laboratory  
Washington, DC 20375-5320

**Cover photos:**

Inspection of the  
Starshine 3 satellite  
prior to its flight  
acceptance  
vibration test

Naval Earth Map  
Observer (NEMO), a  
space-based system  
for collecting broad-  
area Hyperspectral  
Imagery (HSI)

Virtual Information  
Command Center

NIKE Laser  
Facility's  
propagation  
bay

NRL  
Washington, DC

NRL's URL: <http://www.nrl.navy.mil/>

**Quick Reference Telephone Numbers**

**NRL  
WASHINGTON**

**NRL-  
SSC**

**NRL-  
MONTEREY**

**NRL  
CBD**

**NRL FSD  
Patuxent River**

Hotline	(202) 767-6543	(202) 767-6543	(202) 767-6543	(202) 767-6543	(301) 342-4926
Personnel Locator	(202) 767-3200	(228) 688-3390	(831) 656-4721	(410) 257-4000	(301) 342-4926
DSN	297- or 754-	828	878	—	342
Direct-in-Dialing	767- or 404-	688	656	257	342
Public Affairs	(202) 767-2541	(228) 688-5328	(831) 656-4758	—	(301) 342-4926

Additional telephone numbers are listed on pages 144 and 145.

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# NRL FACT BOOK

NAVAL RESEARCH LABORATORY  
WASHINGTON, DC 20375-5320

# Contents

<b>1</b>	<b>INTRODUCTION TO THE NAVAL RESEARCH LABORATORY</b>
1	Mission
3	The Naval Research Laboratory in the Department of the Navy
4	NRL Functional Organization
5	Current Research
8	Major Research Capabilities and Facilities
14	NRL Sites and Facilities
<b>15</b>	<b>EXECUTIVE DIRECTORATE</b>
17	Executive Directorate - Commanding Officer and Director of Research
20	Executive Council
21	Research Advisory Committee
25	Office of Technology Transfer
26	Office of Program Administration and Policy Development
27	Office of Counsel
28	Command Support Division
30	Military Support Division
32	Flight Support Detachment
34	Human Resources Office
<b>37</b>	<b>BUSINESS OPERATIONS DIRECTORATE</b>
40	Associate Director of Research for Business Operations
42	Contracting Division
44	Financial Management Division
46	Supply Division
48	Research and Development Services Division
<b>51</b>	<b>SYSTEMS DIRECTORATE</b>
54	Associate Director of Research for Systems
57	Signature Technology Office
58	Technical Information Division
60	Radar Division
62	Information Technology Division
64	Optical Sciences Division
66	Tactical Electronic Warfare Division
<b>69</b>	<b>MATERIALS SCIENCE AND COMPONENT TECHNOLOGY DIRECTORATE</b>
72	Associate Director of Research for Materials Science and Component Technology
75	Laboratory for Structure of Matter
76	Chemistry Division
78	Materials Science and Technology Division
80	Laboratory for Computational Physics and Fluid Dynamics
82	Plasma Physics Division
84	Electronics Science and Technology Division
86	Center for Bio/Molecular Science and Engineering

<b>89</b>	<b>OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE</b>
92	Associate Director of Research for Ocean and Atmospheric Science and Technology
94	Office of Research Support Services
96	Acoustics Division
98	Remote Sensing Division
100	Oceanography Division
102	Marine Geosciences Division
104	Marine Meteorology Division
106	Space Science Division
<b>109</b>	<b>NAVAL CENTER FOR SPACE TECHNOLOGY</b>
112	Director of Naval Center for Space Technology
114	Space Systems Development Department
116	Spacecraft Engineering Department
<b>119</b>	<b>TECHNICAL OUTPUT, FISCAL, AND PERSONNEL INFORMATION</b>
121	Technical Output
122	Fiscal
126	Personnel Information
<b>127</b>	<b>PROFESSIONAL DEVELOPMENT</b>
129	Programs for NRL Employees
133	Programs for Non-NRL Employees
<b>135</b>	<b>GENERAL INFORMATION</b>
137	Maps
144	Key Personnel

**Photos on opposite page - top to bottom**

The Naval Research Laboratory is located in Washington, DC, on the east bank of the Potomac River.

The NRL Marine Meteorology Division is located in Monterey, California (NRL-MRY).

The Naval Research Laboratory Detachment is located at Stennis Space Center, Bay St. Louis, Mississippi (NRL-SSC).



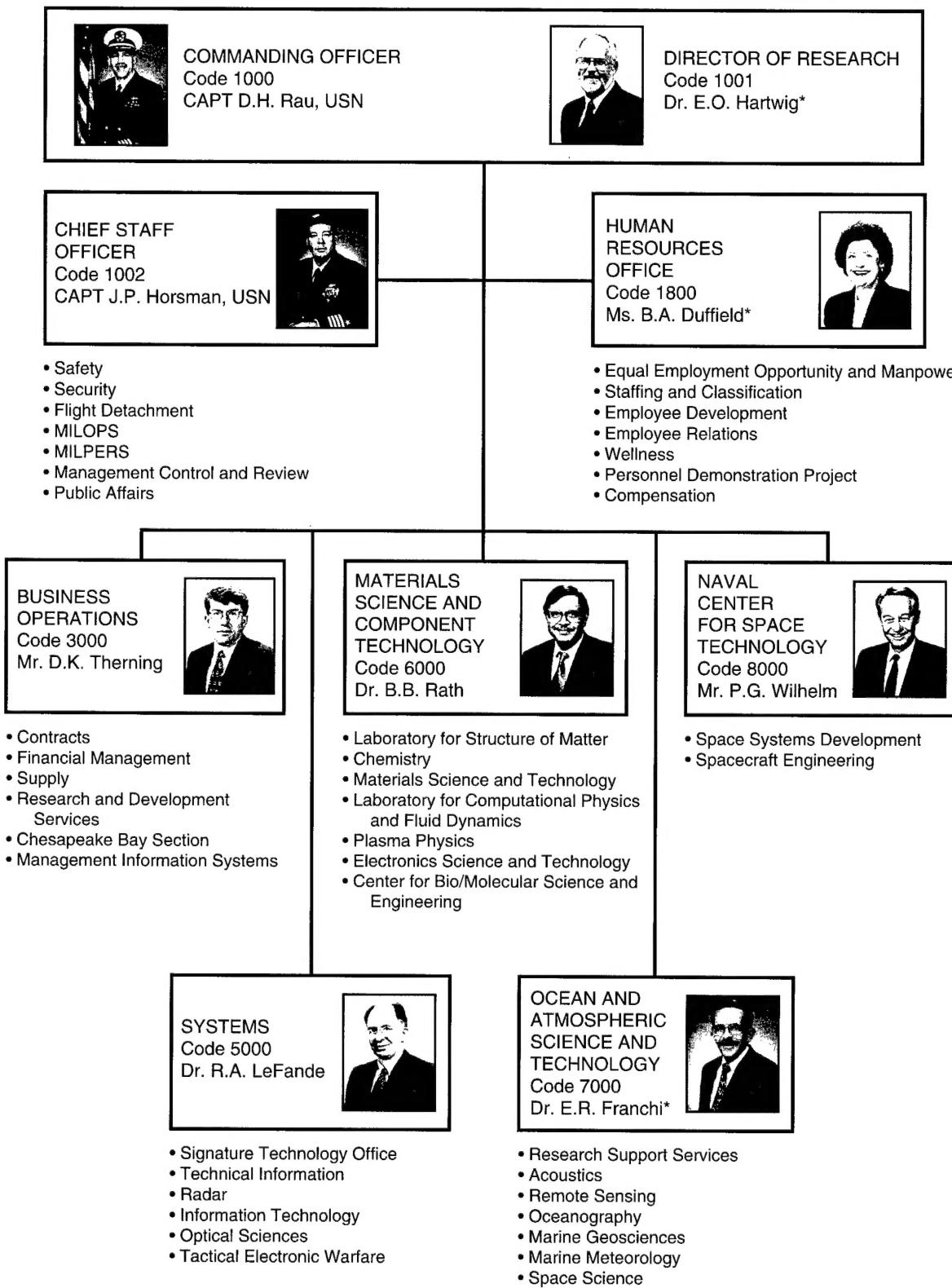
## **The Naval Research Laboratory in the Department of the Navy**

The Naval Research Laboratory is the Department of the Navy's corporate laboratory; it is under the command of the Chief of Naval Research. As the corporate laboratory of the Navy, NRL is the principal in-house component in the Office of Naval Research's (ONR) effort to meet its science and technology responsibilities.

NRL has had a long and fruitful relationship with industry as a collaborator, contractor, and most recently in Cooperative Research and Development Agreements (CRADAs). NRL values this linkage and intends for it to continue to develop.

NRL is an important link in the Navy Research, Development, and Acquisition (RD&A) chain. Through NRL, the Navy has direct ties with sources of fundamental ideas in industry and the academic community throughout the world and provides an effective coupling point to the R&D chain for ONR.

# NRL Functional Organization



\*Acting

# Current Research

The following areas represent broad fields of NRL research. Under each, more specific topics that are being investigated for the benefit of the Navy and other sponsoring organizations are listed. Some details of this work are given in the *NRL Review*, published annually. More specific details are published in reports on individual projects provided to sponsors and/or presented as papers for professional societies or their journals.

## Advanced Radio, Optical, and IR Sensors

- Advanced optical sensors
- EO/MET sensors
- Satellite meteorology
- Precise space tracking
- Radio/infrared astronomy
- Infrared sensors and phenomenology
- Middle atmosphere research
- Image processing
- VLBI/astrometry
- Atmospheric effects on low frequency EM communications
- Optical interferometry
- Imaging spectrometry
- Liquid crystal technology

- Pulse detonation engines
- Charged-particle devices
- Pulse power
- DE effects

## Electronic Electro-optical Device Technology

- Integrated optics
- Radiation-hardened electronics
- Nanotechnology
- Microelectronics
- Microwave and MM wave technology
- Hydrogen masers for GPS
- Aperture syntheses
- Electric field coupling
- Vacuum electronics
- Focal plane arrays
- Infrared sensors
- Radiation effects and satellite survivability
- Molecular engineering

## Computer Science and Artificial Intelligence

- Standard computer hardware, development environments, operating systems, and run-time support software
- Methods of specifying, developing, documenting, and maintaining software
- Human-computer interaction
- Intelligent systems for resource allocation, signal identification, operational planning, target classification, and robotics
- Parallel scientific libraries
- Algorithms for massively parallel systems
- Digital progressive HDTV for scientific visualization
- High performance, all-optical networking
- Adaptive systems: software and devices
- Advanced computer networking
- Simulation management software for networked high performance computers
- Algorithms for incorporating environment and communication systems performance into simulations
- Interactive 3-D visualization tools and applications
- Distributed interactive simulations
- Computational steering

## Electronic Warfare

- EW/C2W/IW systems and technology
- COMINT/SIGINT technology
- EW decision aids, and planning/control systems
- Intercept receivers, signal processing, and identification systems
- Passive direction finders
- Decoys and offboard CM (RF and IR)
- Expendable autonomous vehicles
- Repeaters/jammers and EO/IR active countermeasures and techniques
- Platform signature measurement and management
- Threat and EW systems computer modeling and simulations
- Visualization and virtual reality
- Hardware-in-the-loop and flyable simulators
- Missile warning infrared countermeasures
- RF environment simulators
- EO/IR multispectral/hyperspectral surveillance
- Biocomposites

## Enhanced Maintainability, Reliability, and Survivability Technology

- Coatings
- Friction/wear reduction
- Water additives and cleaners
- Fire safety
- Laser hardening
- Satellite survivability

## Directed Energy Technology

- High-energy lasers
- Laser propagation
- Solid-state and fiber lasers
- High-power microwave sources
- RAM accelerators

Corrosion control  
Automation for reduced manning  
Radiation effects  
Mobility fuels  
Chemical and biological sensors  
Environmental compliance

## **Environmental Effects on Naval Systems**

Meteorological effects on electromagnetic/  
electro-optical system performance  
Meteorological effects on weapons, sensors, and  
platforms  
Air quality in confined spaces  
Electromagnetic background in space  
Solar and geomagnetic activity  
Magnetospheric and space plasma effects  
Nonlinear science  
Ionospheric behavior  
Oceanographic effects on weapons, sensors, and  
platforms  
Electromagnetic, electro-optical, and acoustic  
system performance/optimization  
Environmental hazard assessment  
Contaminant transport  
Biosensors

Information filtering and fusion  
Integrated internet protocol (IP) and asynchronous  
transfer mode (ATM) multicasting  
Reliable multicasting  
High assurance software  
Distributed network-based battle management  
Teraflop scalable shared memory, massively parallel  
computer architectures  
Distributed, secure, and mobile information infra-  
structures  
Virtual engineering  
Simulation-based virtual reality  
Advanced distributed simulation  
High-end, progressive HDTV imagery processing  
and distribution  
Defensive information warfare  
Augmented reality  
Motion science research

## **Imaging Research/Systems**

Remotely sensed signatures analysis  
Real-time signal and image processing algorithms/  
systems  
Image data compression methodology  
Image fusion  
Automatic target recognition  
Scene/Sensor noise characterization  
Image enhancement/noise reduction  
Scene classification techniques  
Radar and laser imaging systems studies  
Coherent/incoherent imaging sensor exploitation  
Remote sensing simulation  
Hyperspectral imaging  
Microwave polarimetry

## **Marine Geosciences**

Marine seismology, including propagation and noise  
measurement  
Geoacoustic modeling in support of acoustic perfor-  
mance prediction  
Geomagnetic modeling in support of nonacoustic  
system performance prediction  
Static potential field measurement and analysis  
(gravity and magnetic) in support of navigation  
and geodesy  
Geotechnology/sediment dynamics affecting mine  
warfare and mine countermeasures  
Foreshore sediment transport  
Mapping and charting, including advanced seafloor  
mapping, imaging systems, and innovative object-  
oriented digital mapping models, techniques, and  
databases

## **Materials**

Superconductivity  
Magnetism  
Biological materials  
Materials processing  
Advanced alloy systems  
Solid free form fabrication  
Environmental effects  
Energetic materials/explosives  
Aerogels  
Nanoscale materials  
Nondestructive evaluation  
Ceramics and composite materials  
Thin film synthesis and processing  
Electronic and piezoelectric ceramics  
Thermoelectric materials  
Metamorphic materials/smart structures  
Computational material science  
Paints and coatings  
Flammability  
Chemical/biological structure analyzer

## **Information Technology**

Antijam communication links  
Next generation, signaled optical network architec-  
tures  
Integrated voice and data  
Arctic communication links  
Information security (INFOSEC)  
Voice processing  
High performance computing  
High performance communications  
Requirement specification and analysis  
Real-time computing  
Wireless mobile routing  
Tactical/warfighter's internetworking  
Natural environments for distributed simulation  
Collaborative engineering environments

Spintronic materials  
Biomimetic materials

## Meteorology

Global, theater, tactical-scale, and on-scene numerical weather prediction  
Data assimilation and physical initialization  
Atmospheric predictability and adaptive observations  
Adjoint applications  
Marine boundary layer characterization  
Air/sea interaction; process studies  
Coupled air/ocean/land model development  
Tropical cyclone forecasting aids  
Satellite data interpretation and application  
Aerosol transport modeling  
Meteorological applications of artificial intelligence and expert systems  
On-scene environmental support system development/nowcasting  
Tactical database development and applications  
Meteorological tactical decision aids  
Meteorological simulation and visualization

## Ocean Acoustics

Underwater acoustics, including propagation, noise, and reverberation  
Fiber-optic acoustic sensor development  
Deep ocean and shallow water environmental acoustic characterization  
Undersea warfare system performance modeling, unifying the environment, acoustics, and signal processing  
Target reflection, diffraction, and scattering  
Acoustic simulations  
Tactical decision aids  
Sonar transducers

## Oceanography

Oceanographic instrumentation  
Open ocean, littoral, and nearshore oceanographic forecasting  
Shallow water oceanographic effects on operations  
Arctic environmental quality  
Modeling, sensors, and data fusion  
Bio-optical and fine-scale physical processes  
Biocorrosion  
Oceanographic simulation and visualization  
Coastal scene generation  
Waves, tides, and surf prediction  
Coupled model development  
Coastal ocean characterization  
Oceanographic decision aids  
Global, theater, and tactical scale modeling  
Remote sensing of oceanographic parameters  
Satellite image analysis

## Space Systems and Technology

Space and ground systems implementation, from concept through orbital operations  
Advanced space systems architectures and requirements  
Systems engineering and analysis  
Mission evaluation and performance assessment  
Spacecraft controllers, processors, signal processing, and software  
Astrodynamics, mathematical modeling, and simulations  
Surveillance sensing technology and applications  
Satellite communications theory and systems  
Tactical communications systems  
Mobile data collection, processing, and dissemination  
Spacecraft electronics design, engineering, and integration  
Satellite ground station, tracking, telemetry, control systems design, and software  
Precise time and time interval technology  
Navigation satellite technology and frequency standards  
Remote sensing, calibration, and research  
Spacecraft electrical power and radio frequency systems

## Surveillance and Sensor Technology

Point defense technology  
Imaging radars  
Surveillance radars  
Multifunction RF systems  
High-power millimeter-wave radar  
Target classification/identification  
Airborne geophysical studies  
Fiber-optic sensor technology  
Undersea target detection/classification  
EO/IR multispectral/hyperspectral detection and classification  
Sonar transducers  
Electromagnetic sensors—gamma ray to rf wavelengths  
SQUID for magnetic field detection  
Low observables technology  
Ultrawideband technology  
VHSIC/MIMIC applications  
Interferometric imagery  
Microsensor system  
Digital framing resonnaissance canvas  
Biologically based sensors

## Undersea Technology

Autonomous vehicles  
Bathymetric technology  
Anechoic coatings  
Acoustic holography  
Unmanned undersea vehicle dynamics  
Weapons launch



# Major Research Capabilities and Facilities

(Listed alphabetically by organizational unit)

## Acoustics Division (Code 7100)

Large, sandy-bottom, holographic pool facility for investigating echo characteristics of underwater buried/near bottom targets and sediment acoustics

Multichannel programmable acoustic signal processing system

Containerized data processing for acoustic array processing at remote sites and aboard ship

One million gallon, vibration-isolated underwater holographic/3-D laser vibrometer facility for studying structural acoustic phenomena for submarine, mine countermeasure and torpedo systems

In-air structural acoustics facility with high spatial density nearfield acoustic holography and 3-D laser vibrometer measurements and processing systems for diagnosing large structures including aircraft interiors and rocket payload fairings

High-powered sound source array

Moored acoustic array with satellite telemetry channels for measuring directional noise

Multiple-towed acoustic arrays with up to 144 acoustic channels for measuring directional noise

Twin underwater towers supporting sources and hydrophone arrays to measure high-frequency propagation, volume, and boundary scattering in shallow water

High-speed maneuverable towed body with MK-50 and synthetic aperture sonars to measure high-frequency boundary scattering and coherence

Tactical oceanography simulation laboratory

Digital Acoustic Buoy Systems (DABS), which can autonomously record data from vertical and/or horizontal acoustic arrays, providing the capability to (1) make long-term ambient noise measurements uncontaminated by the noise of a nearby ship and (2) make single ship propagation measurements

Acoustic Communications Simulation Laboratory

20-ft by 20-ft by 10-ft deep above-ground saltwater acoustic tank facility with environmental control and substantial optical access

## Center for Bio/Molecular Science and Engineering (Code 6900)

Optical equipment

Confocal fluorescent microscope

CW fluorimeter and microscope

Excimer laser projection exposure system

Dektak surface profilometer

Optical and fluorescence microscopes

Photon correlation spectrometer

Picosecond dye laser system

Raman spectrometers

Scanning and transmission electron microscope

SLM fluorimeter (visible through near IR)

Time resolved fluorimeter (nanosecond)

UV-visible absorption spectrophotometers

Analytical instruments

Atomic force/scanning tunnelling microscope

Capillary electrophoresis unit

Contact angle goniometer

Differential scanning calorimeter

GC/MASS spectrometer

DNA synthesizer; DNA sequencer

HPLC

Patch clamp microelectrodes

Potentiometer for electrochemistry

General facilities

Class 100 clean room

Cold room for storage and preparation

Controlled shelf temperature lyophilizer

Silicon graphics IRIS workstation

Freeze-fracture apparatus

High-speed ultracentrifuges

Inert atmosphere dry box

NMR

FTIR

Ellipsometer

Titrating calorimeter

Differential scanning calorimeter

## Chemistry Division (Code 6100)

Synthesis/processing facilities

Paint formulation and coating

Functional polymers/elastomers

Langmuir-Blodgett film

Surface cleaning

Thin film deposition/etching with in-situ control

Marine Corrosion Facility (at Key West, Florida)

Characterization facilities

General purpose chemical analysis

Surface diagnostics

Nanometer scale composition/structure/properties

Magnetic resonance NDI

Tribology

Polymer structure/function

Special purpose capability

Environmental monitoring/remediation

Combustion and fire research

Alternate and petroleum-derived fuels

Simulation/modeling  
Synchrotron radiation beam lines (at NSLS,  
Brookhaven, NY)  
Raman Spectroscopic Laboratory

## **Electronics Science and Technology Division (Code 6800)**

Nano- and microelectronics characterization and processing facilities  
Electron-beam nanowriter  
High-resolution transmission electron microscope  
Scanning tunneling microscopy and electro-optical analysis  
Crystal growing facilities including bulk growth, molecular beam epitaxy, and organometallic chemical vapor deposition  
Optical and electrical characterization of materials  
Electronic testing and analysis facilities  
Vacuum electronics engineering facility  
Femtosecond laser facility

## **Information Technology Division (Code 5500)**

HF modem and channel simulation  
Brandywine antenna range  
Pomonkey test range  
CBD Ship Motion Simulator  
Signal analysis laboratory  
Artificial intelligence computer network  
HCI laboratory  
Certification and INFOSEC engineering laboratory  
Virtual reality laboratory  
DoD High Performance Computing Modernization Program (HPCMP) Distributed Center (DC)  
High-speed ATM network (backbone and to the desktop)  
ATD net Washington area pop for high performance, multigigabit optical streams  
Distributed file systems with authentication (Andrew File System/Multi-Resident Andrew File System (AFS/MRAFS))  
Labwide network, NICEnet, providing computer communications, video services, and gateways to networks and computer systems worldwide  
Satellite dishes for video and data reception  
File server/archiver system for central file storage of labwide data  
Visualization laboratory  
Navy engagement warfare assessment and virtual engineering (newave) research center

## **Laboratory for Computational Physics and Fluid Dynamics (Code 6400)**

Six-processor SGI Power Onyx workstation  
Eighteen-processor SGI Power Challenge  
Twenty-four processor SGI Origin 2000  
Thirty-two processor SGI Origin 2000  
Sixty-four processor HP Exemplar

Sixteen-processor HP Exemplar  
D2 Digital video and animation laboratory  
SUN Microsystems 670MP workstation server  
Over sixty SUN, SGI, and MACINTOSH workstations  
Three-fourths terabyte RAID Disk Storage Systems  
All computers and workstations have network connections to NICENET and ATDNET allowing access to the NRL CCS facilities (including the DoD HPC resources) and many other computer resources both internal and external to NRL.

## **Laboratory for Structure of Matter (Code 6030)**

Two area detector systems  
Two X-ray diffractometers  
Zymark robotics  
Four silicon graphics IRIS workstations  
Protein and peptide chromatography  
Atomic force microscope

## **Marine Geosciences Division (Code 7400)**

Airborne gravimetry, magnetics, and topographic measurements suite coupled with differential GPS yielding position accuracies of <1.0 meter  
100 and 500 kHz sidescan sonar with 2-12 kHz chirp profiler and C<sub>s</sub> magnetometer for seafloor characterization/imaging and shallow subbottom profiling  
Deep-towed acoustic geophysical system operating at 250-650 Hz characterizes subseafloor structure including gas clathrate accumulations and dissociation of methane hydrates  
Acoustic seafloor classification system operating at 15-50 kHz provides underway, real-time prediction of sediment type and consistency  
Seafloor probes for measuring sediment pore water pressures, permeability, electrical resistivity, and acoustic compressional and shear wave velocities and attenuations  
100 and 300 kV transmission electron microscopes with environmental cell for study of sediment fabric, especially impact of organic matter  
Object-oriented digital cartographic modeling techniques and databases with internet access  
Map data formatting facility compresses map information onto compact disk-read only memory media for masters for use in aircraft digital moving map systems  
Magnetic observatory conducts measurements of ambient field and other magnetic phenomena  
Comprehensive geotechnical and geoacoustics laboratory capability  
Airborne ElectroMagnetic (AEM) bathymetry system  
Ocean bottom magnetometer system

3-D, multispectral, subbottom swath imaging system  
Ocean bottom seismographs (OBS)  
In-Situ Sediment Acoustic Measurement System (ISSAMS)  
Instrumented mine shape to measure rates and depths of scour burial  
Hydrothermal plume imaging data acquisition and analysis system  
Integrated digital databases analysis and display system for bathymetric, meteorological, oceanographic, geoacoustic, and acoustic data  
Stereometric video image processing system for use in foreshore morphology measurement  
Sediment gas-content sampler  
Acoustic tomographic probes for surf zone sands and gassy muds

### **Marine Meteorology Division (Code 7500)**

Naval Integrated Tactical Environmental Subsystem (NITES) for fielding regional and shipboard METOC applications  
SMQ-11 shipboard antenna system for retrieving polar-orbiting satellite data  
Geostationary satellite data direct readout and processing center  
Super workstations for numerical weather prediction systems development  
Master Environmental Library (MEL) implemented on superworkstations for archiving and distributing real-time and historical atmosphere/ocean databases  
Bergen Data Center for extensive file serving and research data backup/archival capability  
Data visualization center for developing shipboard briefing tools, displaying observations and model output, and integrating meteorological parameters into tactical simulations

### **Materials Science and Technology Division (Code 6300)**

Ultrasonic gas atomizer  
Hot isostatic press  
Cold isostatic press  
High-energy, dispersive X-ray analytical system  
Electron microprobe, SEM, SAM, and STEM systems  
Quantitative metallography  
Computer-controlled multiaxial loading and SCC measurement systems  
Computer-interactive, nonlinear, multimode fracture measurement system  
Computer-aided, experimental stress analysis  
Crystallite Orientation Distribution Function (CODF)  
Thermoelectric parametric measurement system  
Class 1000 clean room; processing metallic film

Elevated temperature and structural characterization laboratory  
Nondestructive evaluation laboratory  
Closed-loop, low- and high-cycle fatigue systems  
Metallic film deposition systems  
Magnetometry  
Mossbauer spectroscopy  
Cryogenic facilities  
High-field magnets  
High-resolution analytical electron microscope  
Isothermal heat treating facility  
Vacuum arc melting facility  
Vacuum induction melting facility  
3-MeV tandem Van de Graaff accelerator  
200-keV ion-implantation facility  
Microwave test facility  
Excimer laser film deposition facility  
Bomen infrared spectrometer facility  
Diffuse light scattering facility  
Femtosecond laser facility  
Semiconductor assessment facility  
Surface characterization facility

### **Oceanography Division (Code 7300)**

Towed sensor and advanced microstructure profiler systems for studying upper ocean fine and microstructure  
Integrated absorption cavity and optical profiler systems for studying ocean optical characteristics  
Environmental scanning electron microscope and confocal laser scanning microscope for detailed studies of bio-corrosion in naval materials  
Self-contained bottom mounted upwardlooking acoustic profilers for measuring ocean variability  
Acoustic doppler profiler for determining ocean currents while under way  
Data visualization center for displaying ocean model output  
Remotely operated underwater vehicle (ROV)  
Bottom mounted acoustic doppler profilers  
Towed hyperspectra optical array  
SCI processing facility  
Satellite Receiving Stations for AVHRR, SeaWifs, DMSP Ocean Color Processing Facility

### **Optical Sciences Division (Code 5600)**

Short-pulse excitation apparatus for kinetic mechanisms investigations  
IR laser facility for optical characterization of semiconductors  
Mobile, high-precision optical tracker  
Facilities for synthesis and characterization of optical glass compositions and for the fabrication of optical fibers  
Optical and digital image processing facilities  
Silica and IR fluoride/chalcogenide fiber fabrication facilities

Facilities for fabricating and testing integrated optical devices  
 Optical probes laboratory to study viscoelastic, structural, and transport properties of molecular systems  
 Computer IR/EO technology/systems simulation center  
 Laser diode pumped solid-state lasers  
 Field-qualified EO/IR measurements devices  
 Focal plane array evaluation facility  
 Mid-IR, low phonon crystal growth facility  
 Multispectral image processing facility  
 Indoor IR test range  
 NRL P-3 aircraft sensor pallet  
 EO/IR high-resolution reconnaissance/surveillance sensors  
 RF and laser data links  
 Infrared countermeasure techniques laboratory  
 Multi- and hyperspectral sensors and processing  
 Environmental testing of fiber sensors (acoustic, magnetic, electric field, etc.)  
 High-speed, high-power, photodetector characterization  
 Communication link characterization to >100 Gbps  
 RF phase noise, noise figure, and network analysis  
 Ultrahigh-speed A/O convertors

### **Plasma Physics Division (Code 6700)**

PAWN, 1-MJ compact inductive storage facility  
 Gamble II high-voltage pulsed power generators  
 HAWK, 1 MA inductive storage facility  
 PHAROS III, three-beam neodymium-glass laser and target facility  
 Table-Top Terawatt (T<sup>3</sup>) laser system  
 NIKE krypton fluoride laser facility  
 Large volume space chamber (2 m × 5 m)  
 Large area plasma processing system  
 Microwave facility for processing of advanced materials (2.45, 35, 94, and 60-120 GHz)

### **Radar Division (Code 5300)**

Shipboard radar research and development test beds:  
 1. Senrad wideband air surveillance radar facility  
 2. Volume surveillance radar test bed  
 3. Ship self-defense surveillance and engagement demonstration systems  
 4. AN/SPS-49  
 Airborne research radar facility, including advanced profile high-resolution imaging radar and P-3 (1998) with APS-145 Group 2 and CEC  
 High-power 94 GHz radar system  
 Ultrahigh resolution radar system (microwave microscope)  
 Ship radar cross-section computer prediction facility

Electromagnetic numerical computation facility  
 Compact range antenna measurement laboratory and nearfield scanner  
 Experimental mode-stirred chamber for electromagnetic compatibility qualification  
 Space-time adaptive processing (STAP) laboratory  
 Electronic computer-aided design facility  
 Clutter research radar  
 Jet Engine Modulation (JEM) laboratory  
 Microwave and RF instrumentation laboratory  
 Cryogenic microwave and RF measurement facility  
 High-bandwidth, high-capacity data recording system

### **Remote Sensing Division (Code 7200)**

Polar ozone and aerosol monitor space sensor  
 Ground-based stratospheric water-vapor monitoring system  
 SAR processing facility  
 SCI processing facility  
 SEALAB  
 SAIL  
 Hyperspectral imaging, sensors, and processing  
 Optical remote sensing calibration lab/facility  
 Navy prototype optical interferometer  
 NRL/NRAO 74 MHz very large array  
 Free surface hydrodynamics laboratory  
 SSM/I processing facility  
 STEMS system  
 Ocean tower/platform/ship radar  
 Volume Imaging Lidar system  
 Aerosol and field measurement facility  
 Airborne Polarimetric Microwave Imaging Radiometer (APMIR)  
 NRL RP-3A aircraft sensors  
 Airborne Lidar  
 MMW imagers  
 DMSP SSM/I simulator  
 PRT-5 IR radiometer  
 Imaging real-aperture radar (RAR)  
 Flight-level meteorological sensors  
 Hyperspectral sensor systems (PHILLS)  
 Ultrawideband SAR (NUSAR)

### **Research and Development Services Division (Code 3500)**

Military construction  
 ONR facilities support  
 Research support engineering  
 Planning  
 Full range of facility contracting, including construction, architect/engineering services, facilities support, and reserved parking  
 Transportation  
 Telephone services  
 Maintenance and repair of buildings, grounds, and communication and alarm systems

Shops for machining, sheet metal, welding, and plating

## **Spacecraft Engineering Department (Code 8200)**

Chambers:

Thermal-vacuum  
Acoustic reverberation

Facilities:

Shock and vibration test  
Clean-rooms  
Spacecraft-fabrication and assembly  
Fuels test  
Autoclave  
Robotics engineering and controls laboratory  
Dynamic motion simulator  
CAD/CAM  
Automatic welding  
Static loads test  
Spacecraft spin balance  
Modal analysis

## **Space Science Division (Code 7600)**

E.O. Hulbert Center for Space Research

Development and test facilities for spaceborne instruments to perform astrophysical, solar, high-atmospheric, and space-environment sensing

Clean-room facilities

Extensive computer-assisted data manipulation and interpretive capability for space-data imaging and modeling

Backgrounds Center of Expertise (BCoE)

Ballistic Missile Defense Organization (BMDO)

Synthetic Scene Generation Model (SSGM)

Backgrounds Data Center for analysis of BMDO-relevant natural backgrounds

Special Sensor Ultraviolet Limb Imager (SSULI) calibration facility

Ultraviolet remote sensing data center

Low-temperature laboratory

Gamma Ray Observatory (OSSE) operations and data analysis center

Solar instrument test facility

Solar Ultraviolet Spectral Irradiance Monitor (SUSIM) operations and data analysis center

Large Angle Spectrometric Coronagraph (LASCO) operation and data analysis

Extreme-ultraviolet Imaging Telescope (EIT)

Middle Atmosphere High Resolution Spectrograph Investigation (MAHRSI) to measure OH and NO in middle atmosphere

## **Space Systems Development Department (Code 8100)**

Payload test facility and processor development laboratory

Spacecraft high-reliability electronic and electrical production facility

Spacecraft electronic systems integration and test facility

Spacecraft electrical power systems and battery laboratories

Laser communications and electro-optics laboratories

Tactical Technology Development Laboratory (TTDL)

Electromagnetic interference/electromagnetic computability (EMI/EMC) screen room test facility

Precision oscillator (clock) test facility

Radio frequency (RF) system development facility

RF microcircuit fabrication cleanroom facility

Large tapered horn RF anechoic chamber facility  
RF payload development laboratory with anechoic chamber

Precision high-frequency RF compact range anechoic chamber facility

Transportable ground station development, assembly, and test facility

Multiplatform FPGA/ASIC/VLSI Development Laboratory

Satellite telemetry, tracking, and control facilities

Pomonkey Field Site/large antenna, space communications, and research facility

Midway Research Center/space communications and research facility

Optical Telescope Facility

## **Tactical Electric Warfare Division (Code 5700)**

Mobile infrared signature measurement and simulation facility

Mobile ESM laboratory

Hybrid RF/IR missile-seeker simulation facility

Central target simulation facility for developing, testing, and evaluating EW systems and techniques, using real-time, hardware-in-the-loop models

RF simulation laboratory and signal simulators

Radar cross-section measurement facility (at CBD)

Search radar ECM simulator

Advanced tactical EW environment simulator

Electronic warfare coordination test bed

Scale-model analysis facility

Wind tunnel for performance measurements of low Reynolds number vehicles

Optical integration laboratory

Tempest signal-processing laboratory

Simulated ship-mast facility

Secure supercomputer facility

Vehicle development laboratory

Visualization laboratory

## **Technical Information Division (Code 5200)**

History Office

Ruth H. Hooker Research and Technical Information Center:

On-line catalog of unclassified publications  
LAN-based catalog of classified and unclassified publications

Web-access to journals, reports, press releases, NRL publications

Digital library projects with association, commercial, and government publishers

Consortial relationship with NIST, NASA

Goddard Space Flight Center, NSA

Writing, editing, and publication services

Graphic design and printing services

Imaging Center

Photographic laboratory

NRL Exhibit Program: display, design, production

Multimedia design and production

Video editing suite

Scientific and technical photography

Auditorium services

Mail handling services

Correspondence review and archives services

Forms Supply Store

Electronic forms and forms design



## NRL Sites and Facilities

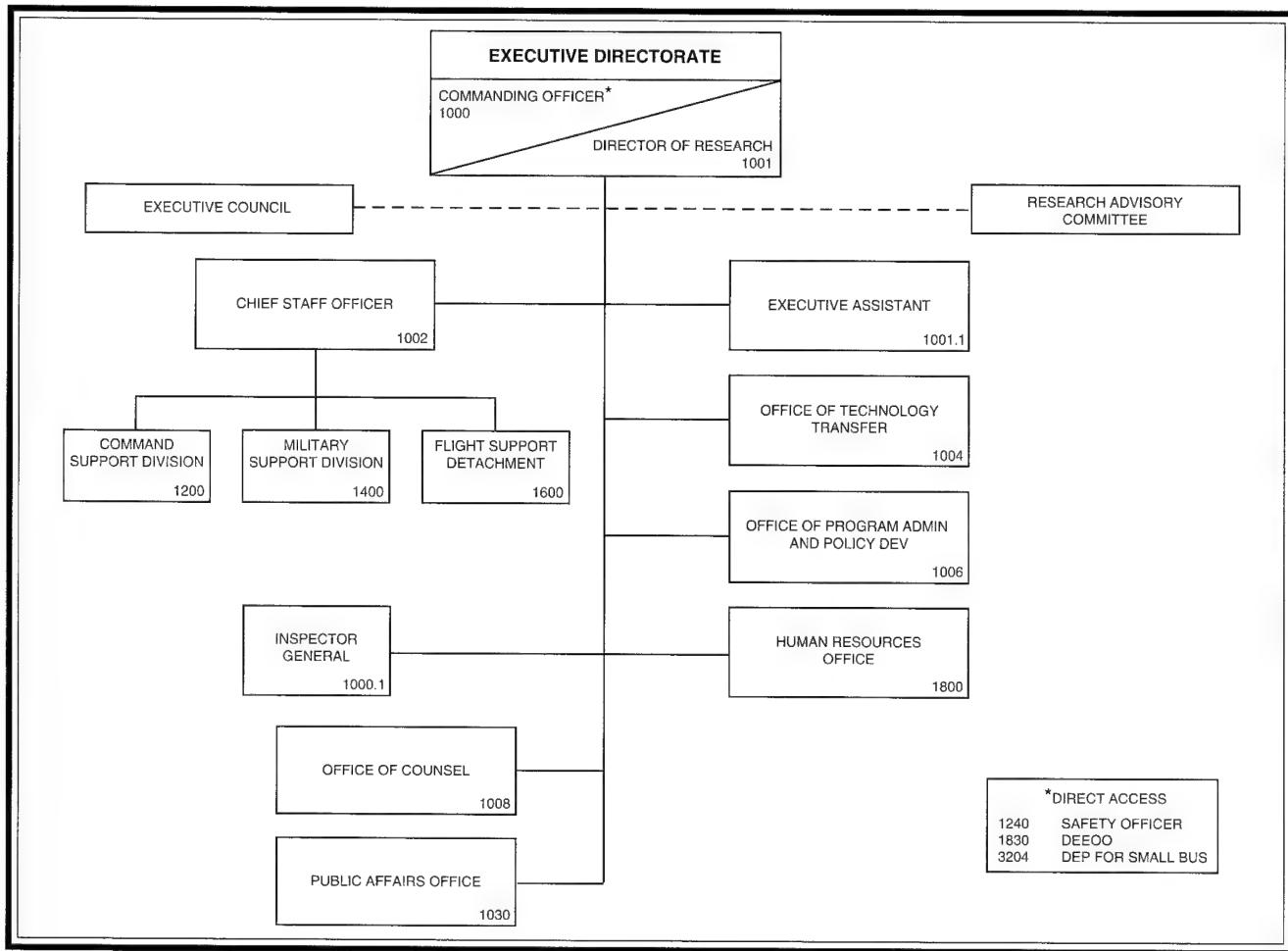
SITE	ACREAGE		BUILDINGS/ STRUCTURES
	LAND OWNED/LEASED	EASEMENT/ LICENSE- PERMIT	
<b>District of Columbia</b> NRL and Artificial Intelligence Center at Bolling AFB	131/0	0/10.24	107/25
<b>Virginia</b> Midway Research Center Quantico	162/0		9/1
<b>Maryland</b> NRL Flight Support Detachment, NAS Patuxent River*	Tenant		
Chesapeake Bay Section and Dock Facility	157/0	0/0.60	62/87
Chesapeake Beach*	2/0		3/3
Multiple Research Site	24/0		10/16
Tilghman Island*	0/0	0/22.98	1/0
Radio Astronomy Observatory	56/0	28.40/0	9/11
Maryland Point*			
Radio Antenna Range			
USAF Receiver Site			
Brandywine*			
Free Space Antenna Range			
Pomonkey*			
<b>Florida</b> Marine Corrosion Facility Key West	Tenant		
<b>California</b> NRL Monterey	Tenant		
Monterey*			
<b>Mississippi</b> Stennis Space Center	Tenant		
Bay St. Louis*			
<b>Alabama</b> Ex-USS <i>Shadwell</i> (LSD-15)	Tenant		
Mobile Bay	Decommissioned 457-ft vessel used for fire research		

### PROPERTY

Land:	Buildings:	Replacement Costs:
Owned 556 acres	RDT&E 3,167,125 ft <sup>2</sup>	Real property – current
Leased 0 acres	Administrative 225,812 ft <sup>2</sup>	Replacement value \$964.5 million
	Other 422,367 ft <sup>2</sup>	Equipment \$186.7 million

\*See maps in the General Information section (page 137).

## **Executive Directorate**



## Key Personnel

Name	Title	Code
CAPT D.H. Rau, USN	Commanding Officer	1000
Dr. E.O. Hartwig**	Director of Research	1001
Mr. D.J. DeYoung	Executive Assistant	1001.1
CAPT J.P. Horsman, USN	Chief Staff Officer/Inspector General	1002/1000.1
CAPT J.P. Horsman, USN	Head Command Support Division	1200
Mr. J.T. Miller	Deputy Head, Command Support Division / Deputy Inspector General	1000.11
Ms. B. Peters	Command Management Review	1000.12
Dr. C.M. Cotell	Head, Office of Technology Transfer	1004
Mrs. L.T. McDonald	Head, Office of Program Administration and Policy Development	1006
Mr. J. McCutcheon	Head, Office of Counsel	1008
Mr. R.L. Thompson	Head, Public Affairs Branch	1030
Mr. S. Burns	Head, Safety Branch	1240
CDR R.B. Grimm, USN	Head, Military Support Division	1400
CDR T.M. Munns, USN	Officer in Charge, Flight Support Detachment	1600
Ms. B.A. Duffield**	Director, Human Resources Office	1800
Ms. D.E. Erwin	Deputy Equal Employment Opportunity Officer	1830
Ms. M. Nicholl	Deputy for Small Business	3204

\*\*Acting

## **EXECUTIVE DIRECTORATE**

### **Code 1000 and Code 1001**

The Commanding Officer (Code 1000) and the Director of Research (Code 1001) share executive responsibility for the management of the Naval Research Laboratory. In accordance with Navy requirements, the Commanding Officer is responsible for the overall management of the Laboratory and exercises the usual functions of command including compliance with legal and regulatory requirements, liaison with other military activities, as well as the general supervision of the quality, timeliness, and effectiveness of the technical work and of the support services.

The Commanding Officer delegates line authority and assigns responsibility to the Director of Research for the technical program, its planning, conduct, and staffing; evaluation of the technical competence of personnel; liaison with the scientific community; selection of subordinate technical personnel; exchange of technical information; and the effective execution of the NRL mission.

Within the limits of Navy regulations, the Commanding Officer and the Director of Research share authority and responsibility for the internal management of the Laboratory. The Commanding Officer retains all authority and responsibility specifically assigned to him by higher authority.

The mission of the Laboratory is carried out by three science and technology directorates and the Naval Center for Space Technology, supported by the Business Operations Directorate and the Executive Directorate. In addition, the Laboratory's operating staffs provide assistance in their special fields to the Commanding Officer and to the Director of Research. The operating staffs are listed on the following pages of this publication.

# Commanding Officer

**C**aptain Douglas H. Rau, USN, born and raised in Mountainside, New Jersey, graduated from the United States Naval Academy in 1974. He participated in the Immediate Graduate Education Program at the University of Washington and then reported to Surface Warfare Officer School and qualified as a Surface Warfare Officer onboard the *USS Fox* (CG-33).

CAPT Rau continued his career serving in engineering, research, development, and project management related billets. In 1986, he transferred to the Engineering Duty Officer community.

## Sea service assignments include:

*USS Fox* (CG-33)

Main Propulsion  
Assistant

*USS Rathburne* (FF-1057)

Chief Engineer  
Squadron Engineer  
Chief Engineer

COMDESRON 35

*USS Nimitz* (CVN-68)

## Shore duty assignments include:

Pearl Harbor Naval Shipyard

Project superintendent for DD963  
overhauls  
Officer in Charge  
Engineering and  
Planning Department Head

CNO's Strategic Studies Group

Fellow  
Engineering Duty Officer Community Manager

Bureau of Personnel

Naval Sea Systems Command

Executive Assistant

## Education:

USNA

BS Ocean Engineering, graduate with distinction

U of Washington

Studies in Naval Architecture

Naval Postgraduate School

MS Mechanical Engineering, graduate with distinction

U of Pittsburgh

Management Program for Executives

CAPT Rau's decorations include the Legion of Merit, Meritorious Service Medal with two stars, Navy Commendation Medal with one star, Navy Achievement Medal, and various unit citations and campaign ribbons.

CAPT Rau is married to the former Colette Greceldhes of Port Orchard, Washington. They have three daughters, Asia, Amber and Alisa.



## Director of Research\*

**D**r. E.O. Hartwig was born in Cincinnati, Ohio on November 22, 1946. He obtained his B.S. degree in biological sciences from the University of Texas at El Paso in 1968, and his Ph.D. from Scripps Institution of Oceanography in 1974. After completing his graduate studies, Dr. Hartwig accepted a position as a researcher at the Scottish Marine Biological Association (SMBA) in Oban, Scotland, where he established a seagoing experimental marine microbiological effort.

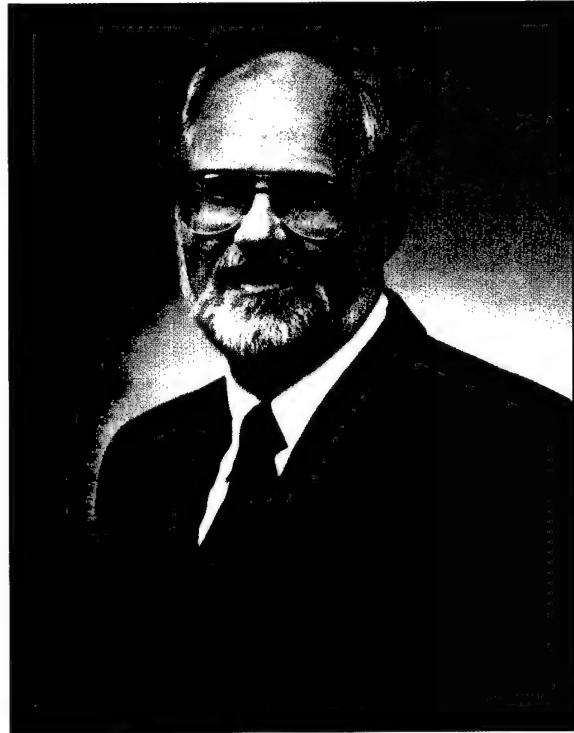
In 1975, Dr. Hartwig returned to the U.S., accepting a position at the Chesapeake Bay Institute of Johns Hopkins University. His shallow water research concentrated on the Chesapeake Bay and its outflow region, in active collaboration with many institutions and scientists. The efforts sought to understand the biological dynamics associated with the Bay's flow regimes, and studied the underlying water column and benthic biological processes resulting in the onset of the seasonal summer anoxia of the bay.

In 1978, Dr. Hartwig accepted a position at Marine Ecological Consultants (MEC), where his research centered on understanding the "before operations" environment at a nuclear generating station. In 1980, Dr. Hartwig accepted a position at the Lawrence Berkeley Laboratory (LBL) at the University of California at Berkeley to head up the biological component of a research team studying the concept of a proposed Ocean Thermal Energy Conversion (OTEC) plant. His work involved extensive interactions with engineers on the operating characteristics of the plant and physical oceanographers modeling flow regimes around the plant and to be generated by the plant.

Following his research at LBL, Dr. Hartwig joined the Office of Naval Research in 1982 as a scientific officer in the Oceanic Chemistry/Biology Program. When the program was split into an Oceanic Chemistry and Oceanic Biology Program, Dr. Hartwig became Program Manager of the Oceanic Biology Program. Here, Dr. Hartwig developed several major interdisciplinary research initiatives for the Navy.

In 1987, Dr. Hartwig was selected as Director of Ocean Sciences at ONR. He enhanced both university interactions with Ocean Sciences and the stature of ONR Ocean Science scientific officers and program managers in the Federal Government. Dr. Hartwig, working with the Oceanographer of the Navy, developed and implemented the Navy's academic research vessel rebuild program, which has resulted in fewer, more capable oceanographic vessels for the next millennium.

Dr. Hartwig joined NRL in October 1992 as Associate Director of Research for Ocean and Atmospheric Science and Technology. In 1996, Dr. Hartwig was presented the Presidential Rank Award of Meritorious Executive in the Senior Executive Service (SES). In 2000, Dr. Hartwig was elected to be President of The Oceanography Society, an international scientific organization.



\*Acting

## Executive Council



The Executive Council consists of executive, management, and administrative personnel. Executive Council members include:

Commanding Officer, Chairperson  
Director of Research  
Associate Directors of Research  
Chief Staff Officer  
Director, Naval Center for Space Technology  
Heads of Divisions  
Head, Laboratory for Structure of Matter  
Head, Laboratory for Computational Physics and Fluid Dynamics  
Head, Center for Bio/Molecular Science and Engineering  
Director, Human Resources Office  
Public Affairs Officer  
Deputy Equal Employment Opportunity Officer  
Head, Office of Program Administration and Policy Development  
Safety Officer  
Head, Office of Counsel  
Head, Office of Technology Transfer

## Research Advisory Committee



The Research Advisory Committee advises the Commanding Officer and the Director of Research on scientific programs and the administration of the Laboratory. The committee assists in planning the long-range scientific program, coordinating the scientific work, reviewing the budget, accepting or modifying problems, considering personnel actions, and initiating such studies as may be necessary or desirable. The membership consists of:

Director of Research, Chairperson  
Commanding Officer  
Associate Directors of Research  
Chief Staff Officer (Observer)



## **Chief Staff Officer/Inspector General Code 1002/1000.1/1200**

The Chief Staff Officer serves as the Deputy to the Commanding Officer and acts for the Commanding Officer in his absence. The Command Support Division (Code 1200), the Military Support Division (Code 1400), and the Flight Support Detachment (NAS Patuxent River, MD, Code 1600) report directly to the Chief Staff Officer. When directed, the Laboratory's Inspector General investigates, inspects, and/or inquires into matters that affect the operation and efficiency of NRL. These matters include but are not limited to: effectiveness, efficiency, and economy; management practices; and fraud and waste. He serves as principal advisor to the Commanding Officer on all inspection matters and audits and is the principal point of contact and liaison with all agencies outside NRL.

CAPT J.P. HORSMAN, USN



## **Public Affairs Officer Code 1030**

The Public Affairs Officer (PAO) advises the Commanding Officer and Director of Research on public affairs matters, including external and internal relations, community outreach, and serves as the Commanding Officer's principal assistant in the area of public affairs. To do this, the PAO plans and directs a program of public information dissemination on official NRL activities. The PAO coordinates responses to requests from the news media and the public for unclassified information or materials dealing with the Laboratory, coordinates participation in community relations activities, and directs the NRL history and internal information programs. The PAO is also responsible for coordinating all actions within the Laboratory that respond to requirements of the Freedom of Information Act (FOIA).

MR. R.L. THOMPSON



## **Safety Officer Code 1240**

The Head of the Safety Branch acts as the Safety Officer and is the program manager for Occupational Safety and Health, Explosives Safety, Industrial Hygiene, Hazardous Material Control and Management, Radiological Safety, Non-Ionizing Radiation Safety, and Environmental Protection. The Safety Branch must ensure that the development, implementation, and maintenance of comprehensive safety and environmental compliance programs, in support of the Laboratory's unique areas of research and development, comply with the appropriate federal, state, Navy, and NRL regulations.

MR. S. BURNS

## **Deputy Equal Employment Opportunity Officer Code 1830**



Ms. D.E. ERWIN

The Deputy Equal Employment Opportunity Officer (DEEOO) is the EEO program manager and the advisor to the Commanding Officer on all EEO matters. The DEEOO manages the discrimination complaint process and directs the Laboratory's affirmative action plans and special emphasis programs (Federal Women's, Hispanic Employment, African American Employment, Asian-Pacific Islanders, American Indian Employment, Individuals with Disabilities, including Disabled Veterans). The DEEOO recruits quality candidates for those areas when underrepresentation exists. Duties also include reviewing, coordinating, and monitoring implementation of EEO policies and developing local guidance, directives, and implementation procedures for the EEO programs.

# Office of Technology Transfer

## Code 1004



DR. C.M. COTELL

### Basic Responsibilities

The Office of Technology Transfer is responsible for coordinating NRL's implementation of the Federal Technology Transfer Act. The Office of Technology Transfer facilitates the transitioning of NRL's innovative technologies for use in products and services to benefit the public. Technology Transfer Office personnel draft Cooperative Research and Development Agreements (CRADAs) under which NRL scientists and engineers work together with industry, academia, state or local governments, or other Federal agencies to develop NRL technologies for government and/or commercial applications. The Technology Transfer Office is also responsible for negotiating patent licensing agreements (PLAs) whereby NRL grants licensees the right to use NRL technologies in products for commercial sale. In addition to promoting NRL technologies through CRADAs, PLAs, and educational marketing mechanisms, the Office of Technology Transfer serves as a resource for NRL scientists and engineers to assist them with all steps toward transitioning their technologies for government or commercial use.

**Personnel:** 4 full-time civilian; 1 part-time civilian

### Key Personnel

Name	Title	Code
Dr. C.M. Cotell	Head	1004
Dr. C. I. Merzbacher	Technology Transfer Officer	1004
Ms. D.F. Vincent	Program Analyst	1004

**Point of contact:** Ms. D. Heddings, Code 1004, (202) 767-7230

# Office of Program Administration and Policy Development

## Code 1006



MRS. L.T. McDONALD

### Basic Responsibilities

The Office of Program Administration and Policy Development provides managerial, technical, and administrative support to the Director of Research (DOR) in such areas as program and policy development, intra-Navy and inter-Service Science and Technology (S&T) program coordination; liaison with other Navy, DoD, and government activities on matters of mutual concern; and support to the Executive Directorate in planning and directing NRL's S&T (6.1, 6.2) program. Specific functions include: monitors and provides background information on technical and policy matters that come under the purview of the DOR; represents NRL, ONR, and/or the Navy on tri-Service or DoD-wide coordination matters; performs special studies or chairs ad hoc study groups regarding program decisions or policy positions; performs special studies involving major NRL programs and resource issues; provides administrative support in the areas of personnel, budget, facilities, equipment, and security; provides executive management information and analyses for various aspects of the S&T program effort; coordinates VIP visits to NRL; manages the NRL directives system; administers the NRL response to Congressional requests; maintains the NRL R&D achievements file; develops the S&T guidance for monitoring and reporting the NRL S&T program; administers NRL's various postdoctoral fellowship programs; and manages the Facility Modernization Program.

**Personnel:** 19 full-time civilian

### Key Personnel

Name	Title	Code
Mrs. L.T. McDonald	Head	1006
Ms. L.S. Herrin	Head, Program Administration Staff	1006.1
Ms. L. Renfro	Head, GLSIP Program	1006.17
Vacant	Administrative Officer	1006.2
Vacant	Head, Management Information Staff	1006.3
Mr. E. Rank	Head, NRL Facilities Staff	1006.4
Ms. M.E. Barton	Head, Directives Staff	1006.5

**Point of contact:** Mrs. M. Boyce, Code 1006B, (202) 767-2421

## Office of Counsel

### Code 1008



MR. J. McCUTCHEON

### Basic Responsibilities

The Office of Counsel is responsible for providing legal services to NRL's management in all areas of general, administrative, intellectual property, and technology transfer law. The Office reviews all procurement-related actions; reviews NRL scientific papers prior to publication; prepares patent applications and prosecutes the applications through the Patent and Trademark Office; defends against contract protests, other contract litigation, and personnel cases; and advises on other legal matters relating to technology transfer, personnel, fiscal, and environmental law.

NRL Counsel also serves as legal advisor to the Commanding Officer and Director of Research.

**Personnel:** 25 full-time civilian

### Key Personnel

Name	Title	Code
Mr. J. McCutcheon	Head, Office of Counsel	1008
Mr. C. Steenbuck	Associate Counsel/General Law	1008.1
Mr. J. Karasek*	Associate Counsel/Intellectual Property	1008.2
Mr. A. Beede	Associate Counsel/SSC Legal Matters	1008.3

**Point of contact:** Ms. K. Head, Code 1008A, (202) 767-7606

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<sup>\*</sup>Acting

## Command Support Division

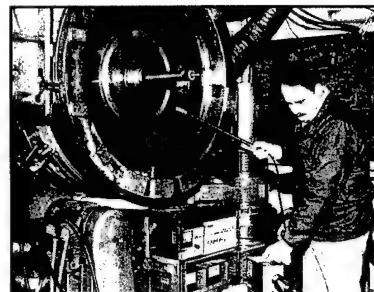
### Code 1200 Staff Activity Areas

- Security
- Safety
- Fire Protection



Security monitoring

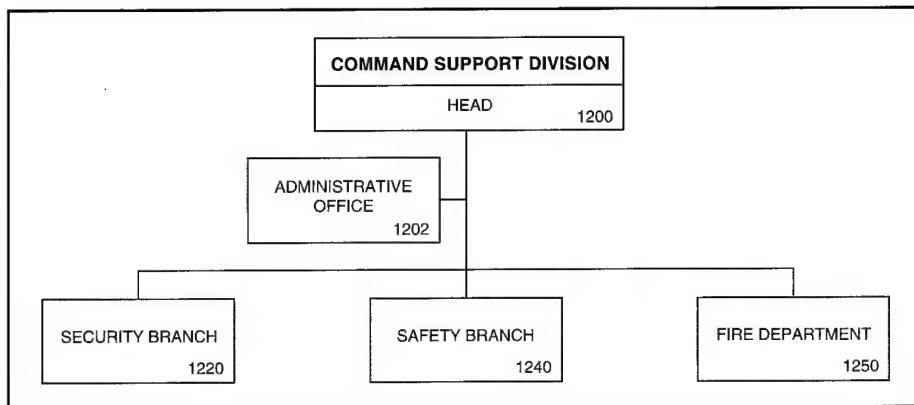
Safety evaluation



Incoming visitor's reception area



CAPT J.P. HORSMAN



## Basic Responsibilities

The Command Support Division provides civilian staff to the Commanding Officer and to the Director of Research. The Division is responsible for the Laboratory's physical, personnel, information, industrial and ADP security programs; communications service; fire protection; occupational safety; health and industrial hygiene; and environmental. It provides intelligence support and support for international cooperative agreements in technology. The Division also coordinates the Laboratory's Management Control Program and provides liaison and coordination for all audit and inspection teams. In addition, administrative/budget supervision over the Military Operations Branch and the Patuxent River Flight Support Detachment is provided.

The Head of the Command Support Division is also the Deputy Inspector General. The Deputy Inspector General is responsible for day-to-day functioning of the office and its staff; program planning and execution, and provides interface with outside agencies concerning inspections and audits conducted or to be conducted by NRL. These include Inspector General representatives from ONR, Navy, DoD, and GAO.

**Personnel:** 120 full-time civilian

## Key Personnel

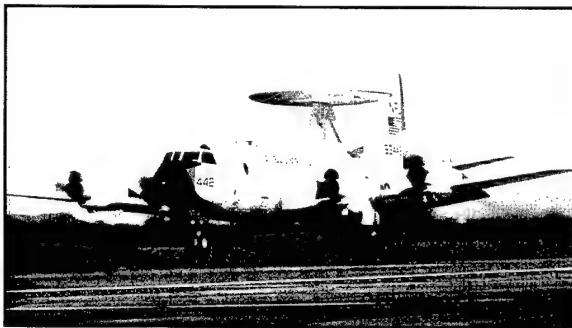
Name	Title	Code
CAPT J.P. Horsman	Head	1200
Ms. M.A. Sepety	Administrative Officer	1202
Mr. J.T. Miller	Head, Security Branch	1220
Mr. J. Sohlke	Head, Information Security Services	1221
Mr. W. Dennis	Head, Physical Security Services	1222
Ms. J. Gray	Head, Special Security Services	1223
Ms. L. Fortner	Head, Personnel Security Services	1224
Mr. S. Burns	Head, Safety Branch	1240
Mr. S. Goldman	Occupational Safety and Health/Industrial Hygiene	1241
Ms. K. Edwards	Explosives Safety	1242
Mr. J. Pawlovich	Health Physics	1244
Ms. K. Edwards	Environmental	1246
Mr. E. Stillwell	Fire Chief	1250

**Point of contact:** Ms. M.A. Sepety, Code 1202, (202) 767-3204

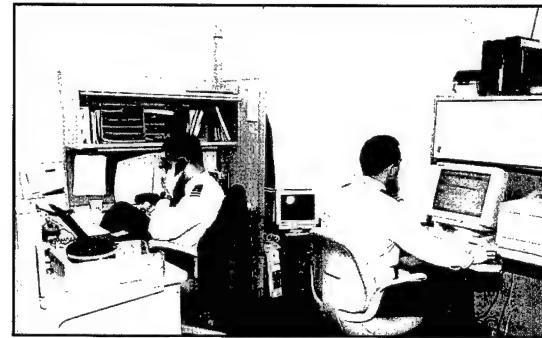
# Military Support Division

## Code 1400 Staff Activity Areas

- Operations
- Administrative Operations



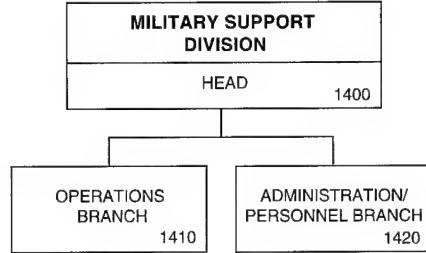
P-3 airborne research facility



Administration



CDR R.B. GRIMM, USN



## Basic Responsibilities

The Military Support Division provides military operational and administrative services to NRL.

The Operations Branch assists NRL Research Directorates in planning and executing project flight missions, develops deployment schedules and military operational and training objectives, and coordinates the Research Reserve Program within NRL.

The Military Administration Branch is responsible for the coordination and efficient functioning of all military administrative operations for NRL (including site detachments). These duties specifically include: personnel actions, maintenance of personnel records, performance evaluations, awards and training; advising the Chief Staff Officer on manpower matters and organization issues; and preparing and administering of the military operational budget.

**Personnel:** 1 full-time civilian; 10 military

## Key Personnel

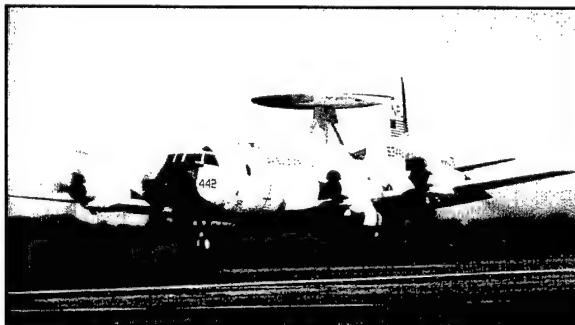
Name	Title	Code
CDR R.B. Grimm, USN	Head	1400
LT A.S. Campbell, USN	Assistant Military Operations Officer	1410
LCDR J.M. Binham, USN	Military Administration and Personnel	1420

**Point of contact:** YN2 R.A. Wilson, USN, Code 1420B, (202) 767-0554

# Flight Support Detachment

## Code 1600 Staff Activity Areas

- Operations
- Administrative Operations
- Aircraft Maintenance
- Safety/NATOPS



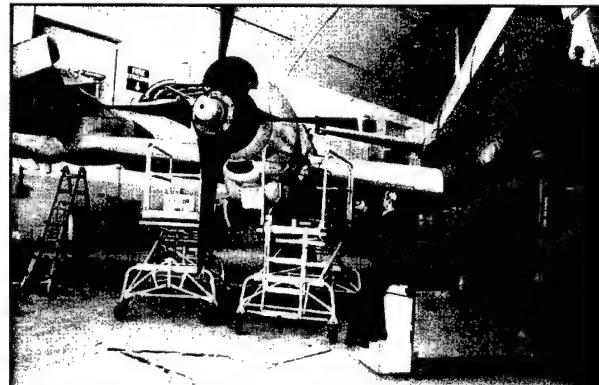
P-3 airborne research facility



Flight Support Detachment hangar



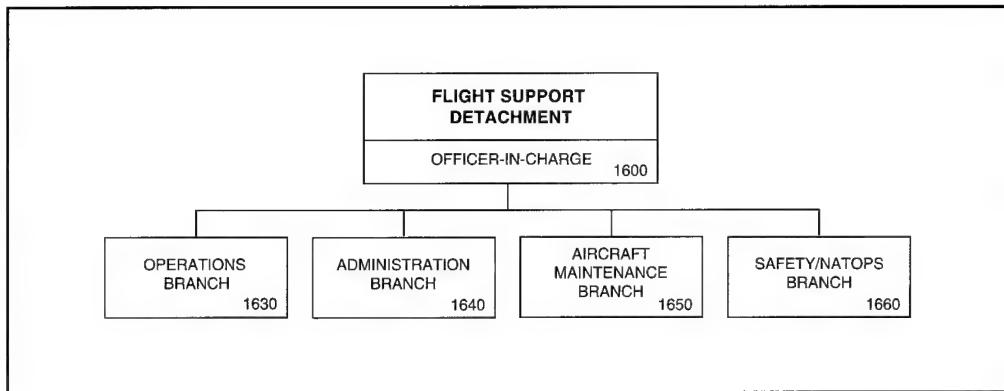
Administration



Aircraft maintenance



CDR T.M. MUNNS, USN



### Basic Responsibilities

The Flight Support Detachment located at NAS Patuxent River, Maryland, operates and maintains five uniquely configured P-3 Orion aircraft. The men and women of the detachment provide the Naval Research Laboratory with airborne research platforms, conducting flights worldwide in support of a wide spectrum of projects and experiments. These include magnetic variation mapping, hydroacoustic research, bathymetry, electronic countermeasures, gravity mapping, and radar research. The detachment annually logs 2,000 flight hours, and in its 34 years the Flight Support Detachment has amassed 55,000 hours of accident-free flying.

**Personnel:** 5 full-time civilian; 95 military

### Key Personnel

Name	Title	Code
CDR T.M. Munns, USN	Officer in Charge	1600
LCDR J.F. Cherra, USN	Assistant Officer in Charge	1600.1
AVCM S.R. May, USN	Command Master Chief	1600.2
Mrs. B.J. Walter	Executive Secretary	1600.4
LT J.L. Virant, USNR	Operations Officer	1630
LT J.D. Morgan, USN	Administrative Officer	1640
LT G.W. Ford, USN	Maintenance Officer	1650
AFCM R.W. Hayes, USN	Maintenance/Material Control Officer	1650.1
LT W.C. Cleary, USN	Head, Safety/NATOPS Branch	1660

**Point of contact:** Mrs. B.J. Walter, Code 1640, (301) 342-3751; DSN 342-3751

# Human Resources Office

## Code 1800 Staff Activity Areas

- Personnel Operations (Staffing, Classification, and Employee Development)
- Employee Relations
- Equal Employment Opportunity and Manpower
- Compensation, Reports, and Demonstration Project



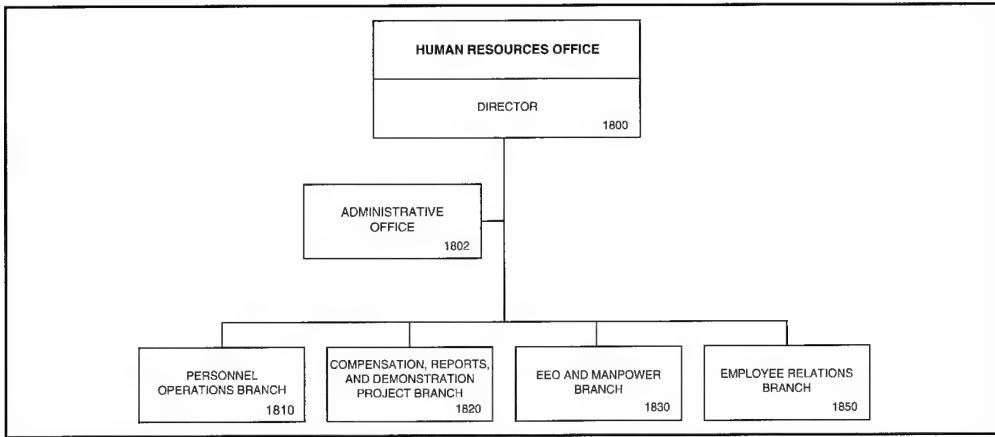
Employee Relations Branch



EEO and Manpower Branch



Personnel Operations Branch



## Basic Responsibilities

The Human Resources Office (HRO) provides civilian personnel, Manpower and Equal Employment Opportunity (EEO) services to the Naval Research Laboratory (NRL). The Human Resources Program provides the full range of operating civilian personnel management in the staffing and placement, position classification, employee relations, labor relations, employee development, EEO functional areas, Manpower Management, and Morale, Welfare, and Recreation Programs.

The HRO at NRL-Main Site in Washington, DC services approximately 3,000 employees as well as provides a centralized capability to perform various managerial, service, and advisory functions in support of field office operations. These include such items as issuance of policy and procedural directives; development, design, and maintenance of automated systems; and monitoring and evaluating product effectiveness to develop and maintain efficient, cost-effective, service-oriented methods.

**Personnel:** 30 full-time civilian

## Key Personnel

Name	Title	Code
Ms. B.A. Duffield*	Director	1800
Ms. R.A. Ward*	Administrative Officer	1802
Ms. C. Downing	Head, Personnel Operations Branch	1810
Ms. B.A. Duffield*	Head, Compensation, Reports, and Demonstration Project Branch	1820
Ms. D.E. Erwin	Head, Equal Employment Opportunity and Manpower Branch	1830
Ms. J.L. Walker	Head, Employee Relations Branch	1850

**Point of contact:** Ms. R.A. Ward, Code 1802, (202) 404-2797

\*Acting

# **Business Operations Directorate**

## **BUSINESS OPERATIONS DIRECTORATE**

### **Code 3000**

The Business Operations Directorate provides executive management, policy development, and program administration for business programs needed to support the activities of the scientific directorates. This support is in the areas of financial management, supply management, contracting, research and development services, and management information systems support.

## Associate Director of Research for Business Operations



**M**r. D.K. Therning was born in Modesto, California, on August 29, 1960. He graduated from Washington State University with a bachelor's degree in finance in 1983 and earned a master's degree in business administration from George Mason University in 1993.

Mr. Therning has accumulated extensive experience in the financial business management of research, development, test, and evaluation (RDT&E) activities within the Department of Navy (DoN) beginning at the Naval Weapons Center, China Lake, California, where he served as a budget analyst in the Public Works Department and then in the Weapons Department.

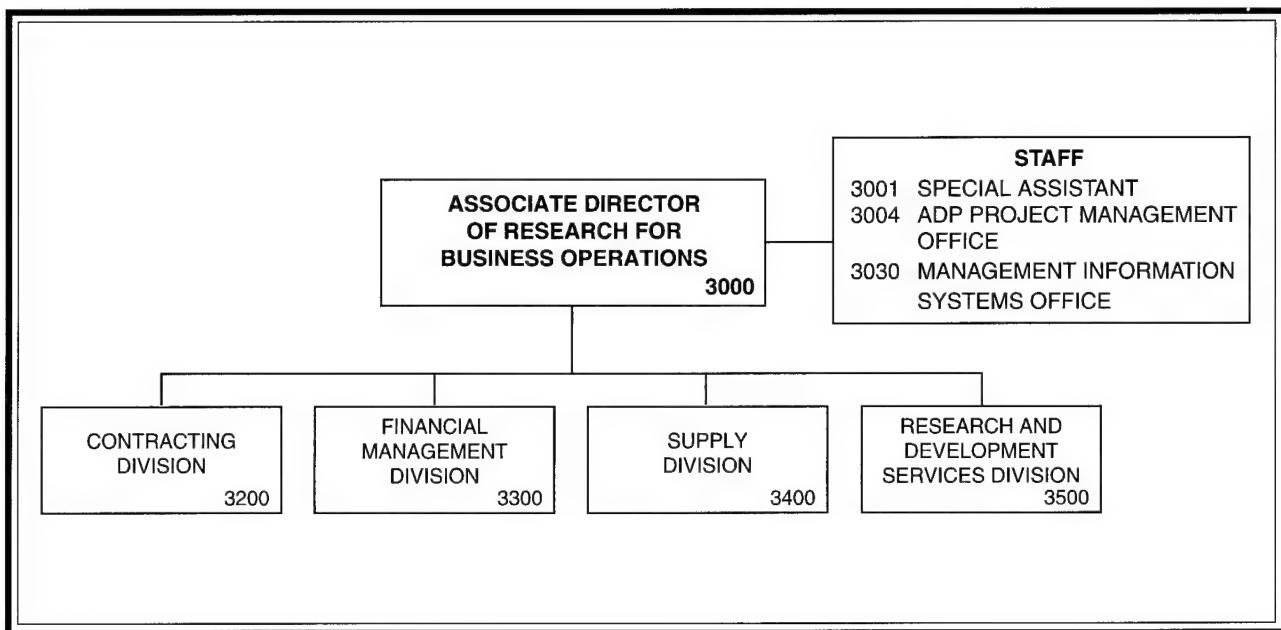
ment. In 1984, he became the Financial Management Advisor to the Ordnance Systems Department. In 1985, under the auspices of the Naval Scientist Training and Exchange Program, he was selected for a one-year assignment in the Office of the Director of Naval Laboratories (DNL), Washington, D.C. He remained on the DNL staff as a budget analyst until 1987, when he was appointed Budget Officer of the DNL's seven Navy Industrial Fund R&D laboratories.

As the DoN reorganized the R&D laboratories and T&E activities, Mr. Therning oversaw the financial reorganization of the DNL labs with other activities into the Naval warfare centers. Upon the disestablishment of DNL, Mr. Therning remained in the Space and Naval Warfare Systems Command as the Director of the Defense Business Operations Fund (DBOF) Resources Management Division, with collateral duty as the Financial Manager of the Naval Command, Control, and Ocean Surveillance Center (NCCOSC). During this time, he managed the conversion of nine appropriated fund engineering activities to DBOF and the financial consolidation of these activities with NCCOSC.

In 1995, Mr. Therning served as Head of the Revolving Funds Branch of the Office of the Assistant Secretary of the Navy (Financial Management and Controller), where he was responsible for the budget formulation and execution processes of all DoN DBOF activities, which includes the RDT&E activities, shipyards, aviation depots, ordnance centers, and supply centers.

Mr. Therning was appointed Head, Financial Management Division/Comptroller of NRL in July 1996. Since that time, his responsibilities have increased in the Business Operations Directorate. In October 1996, in addition to leading the Financial Management Division, he assumed responsibilities for the Management Information Systems office. In January 1999, as an additional duty to his role as Comptroller, Mr. Therning was appointed to the newly established position of Deputy Associate Director of Research for Business Operations to assist in the management and administration of the Business Operations Directorate.

Mr. Therning was Acting Associate Director of Research for Business Operations from April 1999 until March 2000, when he was appointed the Associate Director of Research for Business Operations.



## Key Personnel

Name	Title	Code
Mr. D.K. Therning	Associate Director of Research for Business Operations	3000
Ms. G.L. Spisak	Special Assistant	3001
Vacant	Head, ADP Project Management Office	3004
Ms. P. Lowery	Head, Management Information Systems Office	3030
Mr. J. Ely	Head, Contracting Division	3200
Mr. S. Birk	Head, Financial Management Division	3300
Ms. C. Hartman	Head, Supply Division	3400
Mr. S.D. Harrison	Director, Research and Development Services Division	3500

**Point of contact:** Ms. G.L. Spisak, Code 3001, (202) 404-7462

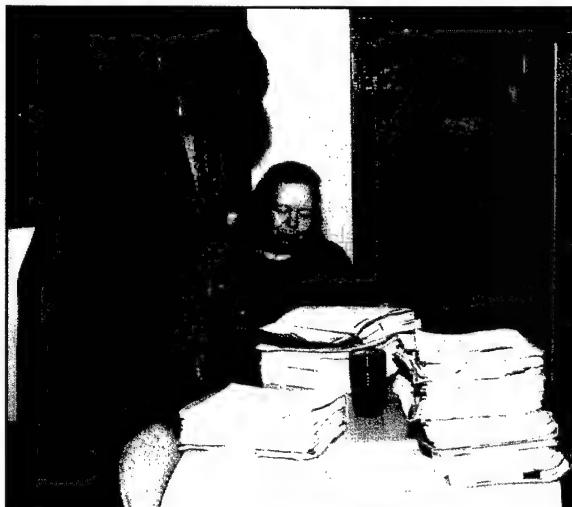
\*Acting

# Contracting Division

## Code 3200

- Advance Acquisition Planning
- Acquisition Strategies
- Acquisition Training
- Contract Negotiations
- Contractual Execution
- Contract Administration
- Acquisition Policy Interpretation and Implementation
- Small Business

Procurement Technician and Contracting Officer  
review contracts for closeout



Contract Specialist consults with  
PIPS Hotline representative



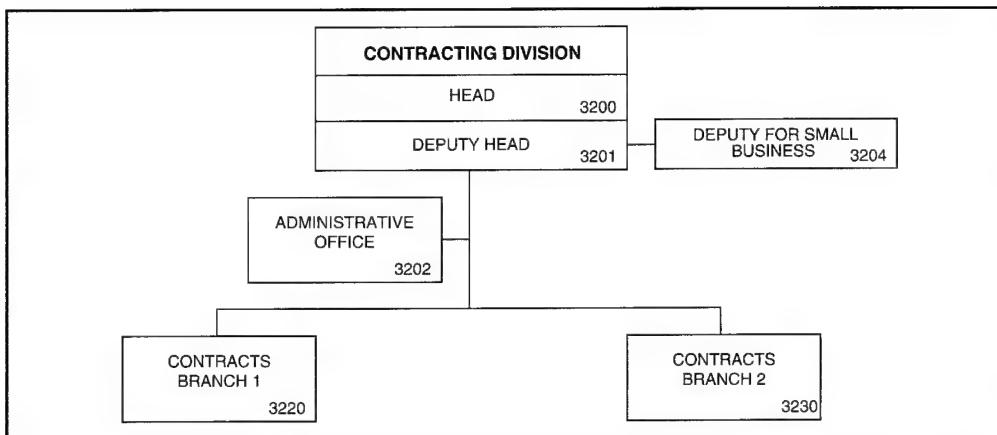
Procurement Technician prepares  
contract documents in PIPS



Division Head conducts staff meeting



MR. J. ELY



## Basic Responsibilities

The Contracting Division is responsible for the acquisition of major research and development, materials, services, and facilities where the value is in excess of \$100,000. It also maintains liaison with the ONR Procurement Directorate on procurement matters involving NRL. Specific functions include: providing consultant and advisory services to NRL division personnel on acquisition strategy, contractual adequacy of specifications, and potential sources; reviewing procurement requests for accuracy and completeness; initiating and processing solicitations for procurement; awarding contracts; performing contract administration and post-award monitoring of contract terms and conditions, delivery, contract changes, patents, etc., and taking corrective actions as required; providing acquisition-related training to division personnel; and interpreting and implementing acquisition-related Federal Department of Defense and Navy regulations.

**Personnel:** 40 full-time civilian

## Key Personnel

Name	Title	Code
Mr. J. Ely	Head	3200
Ms. M.A. Carpenter	Deputy Head	3201
Ms. J. Halperson	Administrative Officer	3202
Ms. M. Nicholl	Deputy for Small Business	3204
Ms. W. Cosby	Head, Contracts Branch 1	3220
Mr. J. Adams	Head, Contracts Branch 2	3230
Ms. P. Lewis	Head, Contracts Section, SSC	3235

**Point of contact:** Ms. J. Halperson, Code 3202, (202) 767-3749

# Financial Management Division

## Code 3300

- Budget
- Reports and Statistics
- Accounting
- Travel Services
- Payroll Liaison



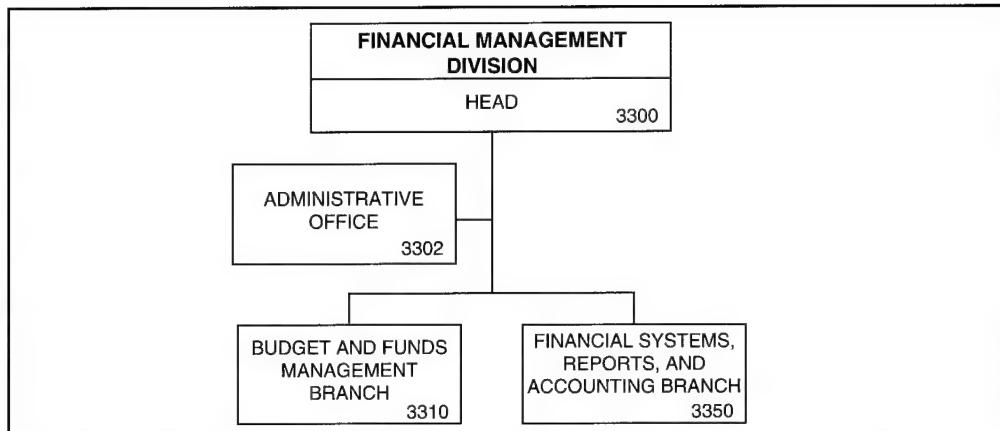
The Budget Branch prepares various financial analyses, reports, and studies in response to external data calls and/or management requests



The Financial Services Section coordinates efforts with DFAS to complete payment transactions related to NRL business, such as personnel for payroll and travel expenses



MR. S. BIRK



## Basic Responsibilities

The Financial Management Division (FMD) develops, coordinates, and maintains an integrated system of financial management that provides the Comptroller, Commanding Officer, the Director of Research, and other officials of NRL the information and support needed to fulfill the financial and resource management aspects of their responsibilities. FMD translates the NRL program requirements into the financial plan, formulates the NRL budget, monitors and evaluates performance with the budget plan, and provides recommendations and advice to NRL management for corrective actions or strategic program adjustments. FMD maintains the accounting records of NRL's financial and related resources transactions and prepares reports, financial statements, and other documents in support of NRL management needs and/or to comply with external reporting requirements. FMD provides financial management guidance, policies, advice, and documented procedures to ensure that NRL operates in compliance with Navy and DoD regulations and with economy and efficiency. FMD coordinates efforts with the Defense Finance and Accounting Service (DFAS) to complete payment transactions related to NRL business (e.g., the payment of NRL personnel for payroll and travel expenses and the payment to NRL's contractors and vendors for goods and services purchased by NRL). Additionally, FMD develops, operates, and maintains automated business and management information systems supporting the lab-wide administrative and business processes, including financial management, procurement and contracting, stores and inventory, asset management, human resources, facilities, and security.

**Personnel:** 67 full-time civilian

## Key Personnel

Name	Title	Code
Mr. S. Birk	Head, Financial Management Division	3300
Ms. R. Smith	Administrative Officer	3302
Mr. T. Kim	Head, Budget and Funds Management Branch	3310
Mr. J.V. Thomas	Head, Financial Systems, Reports, and Accounting Branch	3350
Mr. M. Mann	Head, Cost Accounting Section	3351
Vacant	Head, Controls Unit	3351.1
Ms. L. Pollard	Head, Accounts Payable Unit	3351.2
Mr. D. Tyndall	Head, Financial Services Section	3352
Ms. A. Cutchember	Head, Payroll Services Unit	3352.1
Ms. T. Frye	Head, Travel Services Unit	3352.2
Ms. D. Edwards	Head, Asset Management Unit	3352.3

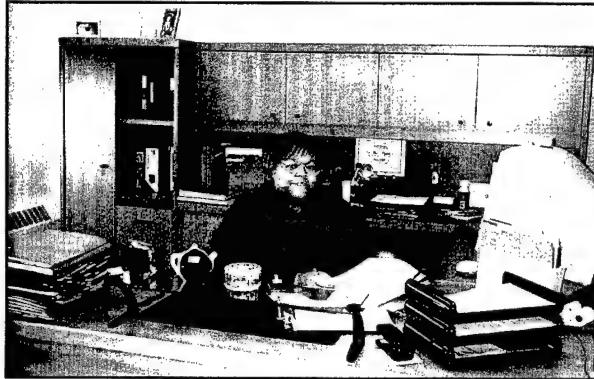
**Point of contact:** Ms. R. Smith, Code 3302, (202) 767-2950

# Supply Division

## Code 3400

- Disposal and Storage
- Store Material Issues
- Customer Liaison
- Automated Inventory Management System
- Purchasing
- Receipt Control
- Material Control
- Technical

Head of the Purchasing Branch reviews purchase order folder



Customer and employee at the Supply store



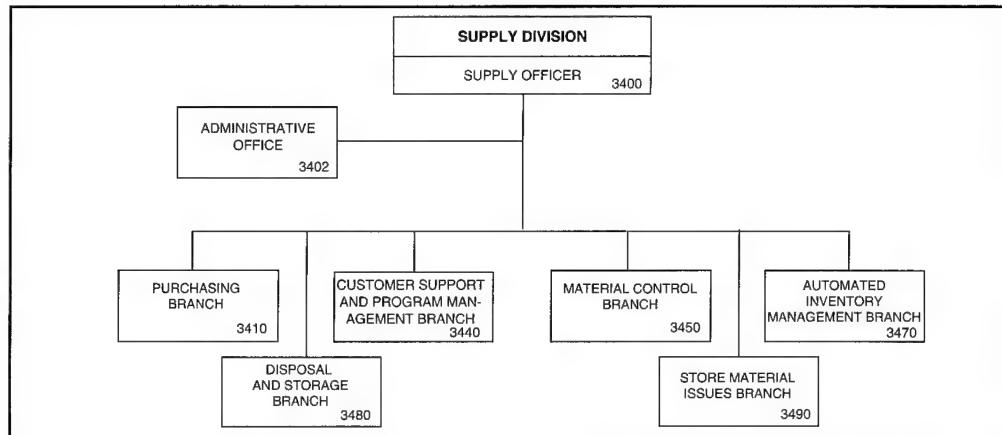
Woodworkers prepare boxes for shipping



Disposal and Storage in building 49



Ms. C. HARTMAN



## Basic Responsibilities

The Supply Division provides the Laboratory and its field activities with contracting, supply management, and logistics services. Specific functions include: procuring required equipment, material, and services; receiving, inspecting, storing, and delivering material and equipment; packing, shipping, and traffic management; surveying and disposing of excess and unusable property; operating various supply issue stores and performing stock inventories; providing technical and counseling services for the research directorates in the development of specifications for a complete procurement package; and obtaining and providing guidance in the performance stages of contractual services.

**Personnel:** 85 full-time civilian

## Key Personnel

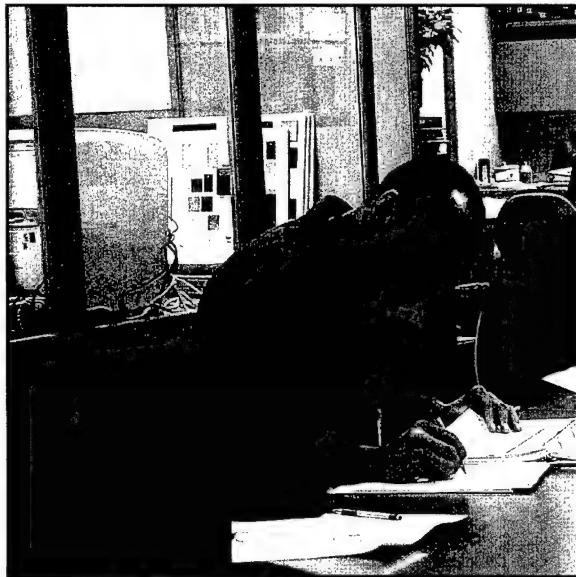
Name	Title	Code
Ms. C. Hartman	Supply Officer	3400
Ms. A. Olson	Administrative Officer	3402
Ms. M. Smith	Head, Purchasing Branch	3410
Ms. P. Carter	Head, Customer Support and Program Management Branch	3440
Mr. W. Myers	Head, Material Control Branch	3450
Ms. L. Shaw	Head, Automated Inventory Management Branch	3470
Mr. R. Baker	Head, Disposal and Storage Branch	3480
Mr. M. Clark	Head, Store Material Issues Branch	3490

**Point of contact:** Ms. A. Olson, Code 3402, (202) 767-3871

## Research and Development Services Division

### Code 3500

- Technical/Support Services
- Operations
- Shop Services
- Chesapeake Bay Section
- Customer Liaison



Reviewing engineering plans and specifications

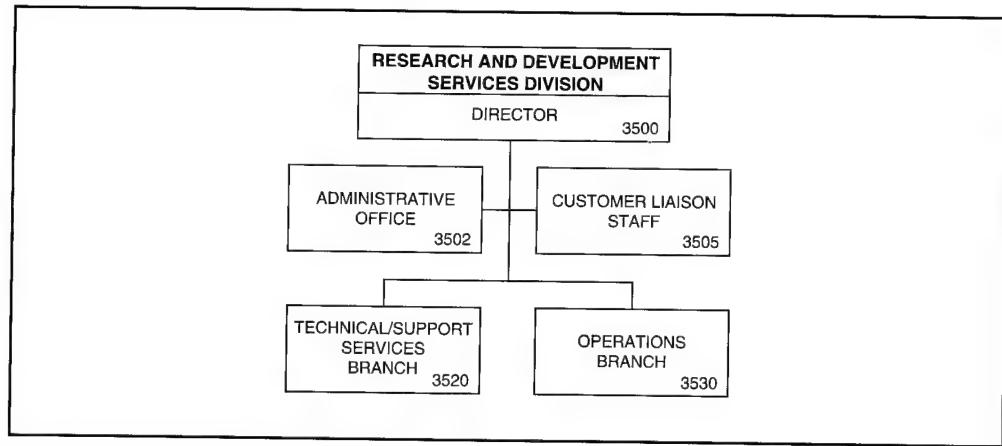
Fabricating smoke detectors for USS *Shadwell*



Using Numerical Control machine for R&D product



MR. S. HARRISON



## Basic Responsibilities

The Research and Development Services Division is responsible for the physical plant of the Naval Research Laboratory and subordinate field sites. The responsibilities include military construction, engineering, and coordination of construction, facility support services, planning, maintenance/repair/operation of all infrastructure systems, and transportation.

The Division provides engineering and technical assistance to research divisions in the installation and operation of critical equipment in support of the research mission.

**Personnel:** 123 full-time civilian

## Key Personnel

Name	Title	Code
Mr. S. Harrison	Director	3500
Ms. L. Jones	Administrative Officer	3502
Mr. M. Kosky	Head, Customer Liaison Staff	3505
Mr. T. Hull	Head, Technical/Support Services Branch	3520
Mr. T. Hull*	Head, Engineering Section	3521
Ms. T. Downing*	Head, Chesapeake Bay Section	3522
Mr. J. Headley	Head, Shop Services Section	3523
Mr. F. Regalia	Head, Operations Branch	3530
Mr. J. Schultz	Head, Production Control Section	3531

**Point of contact:** Ms. L. Jones, Code 3502, (202) 767-2168

\*Acting

# **Systems Directorate**

# SYSTEMS DIRECTORATE

## Code 5000

The Systems Directorate applies the tools of basic research, concept exploration, and engineering development to expand operational capabilities and to provide materiel support to Fleet and Marine Corps missions. Emphasis is on technology, devices, systems, and know-how to acquire and move war-fighting information and to deny these capabilities to the enemy. Current activities include:

- New and improved radar systems to detect and identify ever smaller targets in the cluttered littoral environment;
- Optical sensors and related materials to extract elusive objects in complex scenes when both processing time and communications bandwidth are limited;
- Unique optics-based sensors for detection of biochemical warfare agents and pollutants, for monitoring structures, and for alternative sensors;
- Advanced electronic support measures techniques for signal detection and identification;
- Electronic warfare systems, techniques, and devices including quick-reaction capabilities;
- Innovative concepts and designs for reduced observables;
- Techniques and devices to disable and/or confuse enemy sensors and information systems;

- Small "intelligent"/autonomous land, sea, or air vehicles to carry sensors, communications relays, or jammers; and

- High performance/high assurance computers with right-the-first-time software and known security characteristics despite commercial off-the-shelf components and connections to public communications media.

Many of these efforts extend from investigations at the frontiers of science to the support of deployed systems in the field, which themselves provide direct feedback and inspiration for applied research and product improvement and/or for quests for new knowledge to expand the available alternatives.

In addition to its wide-ranging multidisciplinary research program, the Directorate provides support to the Corporate Laboratory in shared resources for High Performance Computing and Networking, Technical Information collection and distribution and in coordination of Laboratory-wide efforts in Signature Technology, Counter-Signature Technology, Theater Missile Defense, and the Naval Science Assistance Program.

## Associate Director of Research for Systems



**D**r. R.A. LeFande was born on Staten Island, New York on February 8, 1941. He attended the Brooklyn Technical High School and obtained his undergraduate degree in physics from the University of Rhode Island in 1962. After a brief tour as a telephone equipment engineer with Western Electric Company in New York City, he returned to academic pursuits, earning a Master's degree in physics from the Rutgers University in 1965.

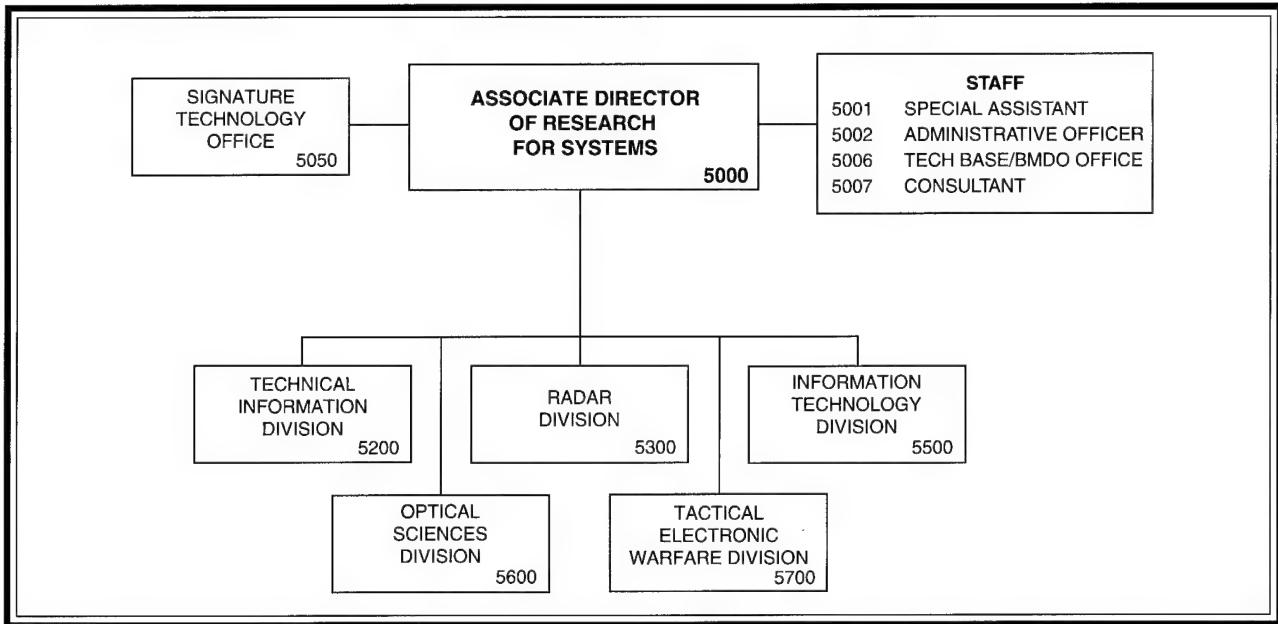
In July of 1965, Dr. LeFande joined the Naval Research Laboratory as a research physicist in the Satellite Communications Branch. He worked on a variety of projects related to the

design of waveforms for Naval applications, calibration of antennas and path losses by methods borrowed from radio astronomy, and on the design and acquisition of satellite communication terminals for shipboard and submarine use. By drawing on this work for a thesis topic, he obtained his Ph.D. from the University of Maryland in 1973, in the areas of astronomy and astrophysics.

In 1976, Dr. LeFande became Head of the Special Communications Branch where he nurtured and encouraged an NRL team of scientists and engineers in the development of satellite communications terminals that are now being deployed in the Fleet, and in establishing the scientific understanding and practical design principles that contributed to the selection of waveforms for MILSTAR and other systems.

From 1979 to 1981, Dr. LeFande was Technical Director and System Engineer of the Special Communication Project of the Naval Electronic Systems Command. He oversaw several research and acquisition programs related to submarine communications, which covered the spectrum from extremely low frequencies through optics and included the maintenance and operation of a worldwide network of radio transmitter facilities. After termination of the project and a brief tour as Deputy Director, Research and Technology Group, Dr. LeFande returned to NRL as Superintendent of the Aerospace Systems Division. Here he guided a diverse program of basic and applied research in Wide Area Surveillance Systems, Space Warfare, and in related areas of physical science, materials, and device technology. From 1983 to 1990, Dr. LeFande served as Associate Deputy Assistant Secretary of the Navy (C<sup>3</sup>I and Space), providing technical and philosophical advice to eight assistant and deputy assistant secretaries. In this capacity, he took a keen interest in the issues of acquisition management reform and of the appropriate roles and missions of the Laboratory and the other Centers in the acquisition process. During this tour, Dr. LeFande was selected as a Legis Fellow and served on the staff of Representative Byron for six months in 1989, working on a variety of issues and legislation related to the Armed Services, Science and Technology, Foreign Affairs, and other matters.

Dr. LeFande returned to the Laboratory in October 1990, where he served on the staff of the Director of Research. He was designated Acting Associate Director of Research in February 1991, and Associate Director of Research in February 1992.



## Key Personnel

Name	Title	Code
Dr. R.A. LeFande	Associate Director of Research for Systems	5000
Ms. B.J. Turner	Special Assistant	5001
Ms. D. Ernst	Administrative Officer	5002
Dr. S. Sacks	Head, Technology Base/Ballistic Missile Defense Office	5006
Dr. M.I. Skolnik	Consultant	5007
Dr. D.W. Forester	Head, Signature Technology Office	5050
Mr. J.R. Lucas*	Head, Technical Information Division	5200
Mr. P. Hughes II*	Superintendent, Radar Division	5300
Dr. R.P. Shumaker	Superintendent, Information Technology Division	5500
Dr. T.G. Giallorenzi	Superintendent, Optical Sciences Division	5600
Dr. J.A. Montgomery	Superintendent, Tactical Electronic Warfare Division	5700

**Point of contact:** Ms. S.S. Harris, Code 5000A, (202) 767-3324

\*Acting



## **Technology Base/Ballistic Missile Defense (BMD) Office Code 5006**

The Head of the Technology Base/BMD Office carries out program management activities pertaining to the Navy BMD, SBIR, critical technology, and other technology efforts. Mission activities include assurance of technical quality and program relevance, technology philosophy, orientation of the program to priority needs and transition opportunities, and overall coordination of NRL efforts. He is the Laboratory point of contact with the Program Offices for this work.

DR. S. SACKS



## **Consultant Code 5007**

The radar consultant provides expert advice, historical perspectives, analyses, and investigations in the field of radar, related systems, phenomenology, and applications to the Systems Directorate, NRL, the Navy, and other DoD organizations as requested.

DR. M.I. SKOLNIK

# Signature Technology Office

## Code 5050



DR. D.W. FORESTER

- Electromagnetic Scattering Fundamentals
- Low Observables Materials
- Multidisciplinary Program Management
- Technology Transfer

### Basic Responsibilities

The NRL Signature Technology Office (STO) performs research and manages/coordinates an integrated, comprehensive research and development program at NRL addressing all aspects of signature control and countersignature control as they apply to Navy weapons systems. The STO monitors and evaluates signature control technology development efforts within government and industry and facilitates the incorporation of advanced signature control technologies into present and future Navy systems. It provides a central point of contact for outside agencies on matters concerning the STO program.

**Personnel:** 15 full-time civilian

### Key Personnel

Name	Title	Code
Dr. D.W. Forester	Research Physicist	5050

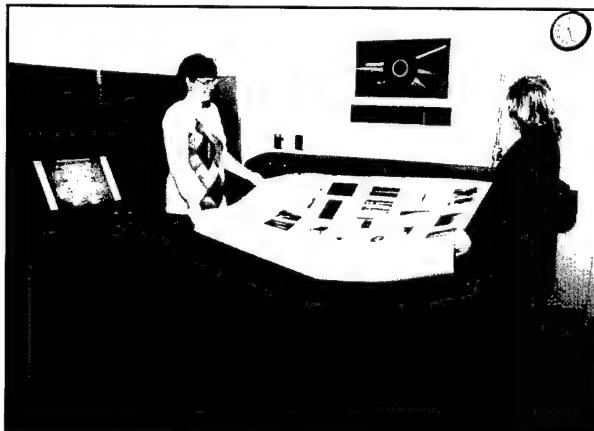
**Point of contact:** Ms. N.A. Carpenter, Code 5050A, (202) 767-3116

# Technical Information Division

## Code 5200

- NRL Historian
- Research Library and Technical Information Center
- Publications, Graphic Design, and Printing Services
- Photographic, Video, and Imaging Services
- Exhibits/Multimedia
- Auditorium Services
- Administrative Services

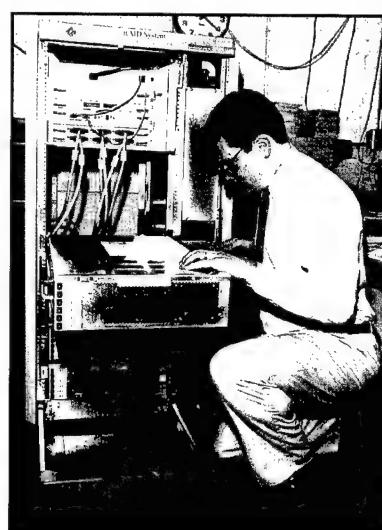
Printout of a collection of images from NRL's 75th Anniversary exhibit on TID's new color, wide-format Novajet printer.



Mail clerks sort mail by directorate and file into bins by organizational codes. Mail is bundled and delivered once a day.

The Library uses a 3.24 GB SPARC Storage RAID array to cache PDF files of the more than 160 journals it networks to NRL/

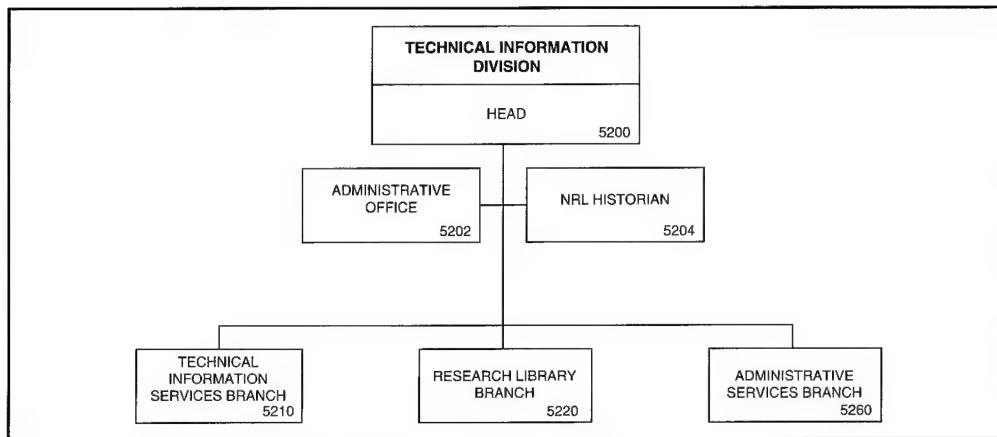
ONR researchers through its Web-based TORPEDO system. In addition, TORPEDO, as the centerpiece of the Library's Digital Library Initiative, provides access to about 5,000 research reports, reprints of publications by NRL authors, and NRL press releases.



The Publications Services Section staff reviews press sheets for one of NRL's publications



MR. J.R. LUCAS\*



## Basic Responsibilities

The Technical Information Division (TID) provides centralized support to the Laboratory, and sometimes the Office of Naval Research, by collecting, retaining, processing, publishing, presenting, and distributing information in various forms to many audiences.

TID supports the Laboratory by providing a full range of library services; by editing and publishing reports and publications; by performing specialized scientific and general photographic services, illustration and graphic design services, imaging support, scientific composition, and special projects graphics; and by providing photographic and video data-gathering and editing services.

**Personnel:** 74 full-time civilian

## Key Personnel

Name	Title	Code
Mr. J.R. Lucas*	Head	5200
Ms. M.B. Gutierrez	Administrative Officer	5202
Dr. D. van Keuren	NRL Historian	5204
Mr. J.R. Lucas	Head, Technical Information Services Branch	5210
Ms. L. Stackpole	Head, Research Library Branch	5220
Ms. L. Warder	Head, Administrative Services Branch	5260

**Point of contact:** Ms. M.B. Gutierrez, Code 5202, (202) 767-3370

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<sup>\*</sup>Acting

# Radar Division

## Code 5300

### Staff Activity Areas

AEGIS coordination

Marine Corps/IFF coordination

Electromechanical design

Multifunction RF systems

High-power millimeter wave radar

### Radar Analysis

Target signature prediction

Electromagnetics and antennas

Airborne early-warning radar (AEW)

Inverse synthetic aperture radar (ISAR)

Space-time adaptivity

Mark XII IFF improvements

Future identification technology

### Advanced Radar Systems

High-frequency over-the-horizon radar

Signal analysis

Signal processing and equipment

Computer Aided Design (CAD)

Electromagnetic Compatibility/Electromagnetic

Interference (EMC/EMI)

### Target Characteristics

Shipboard surveillance radar

Ship self defense

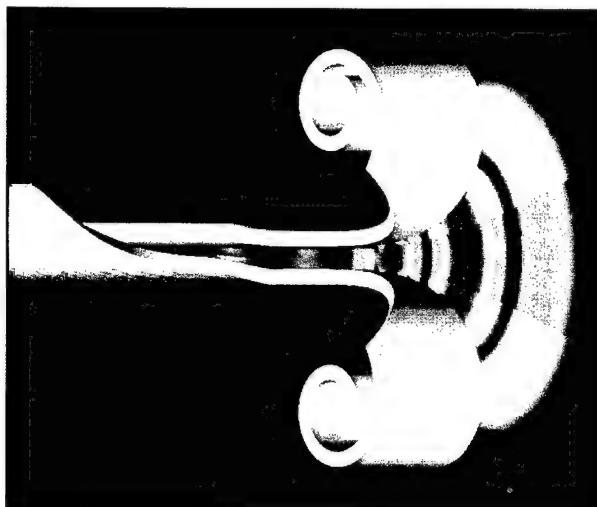
Electronic counter-countermeasures

Target signature recognition

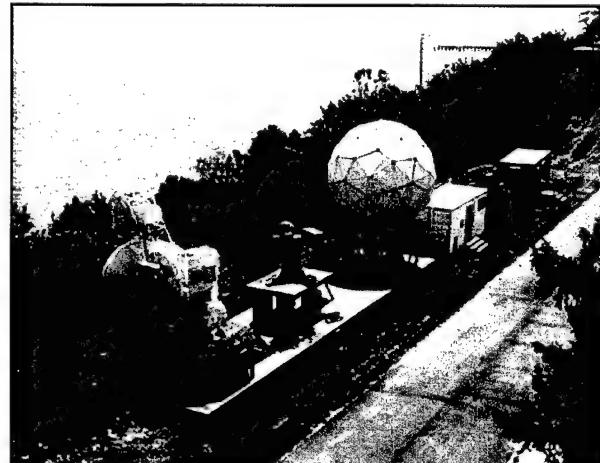
Digital T/R modules

Sea clutter characterization

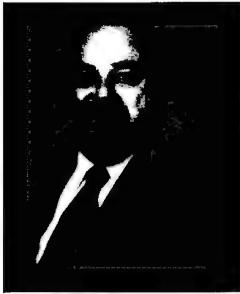
Ultrawideband technology



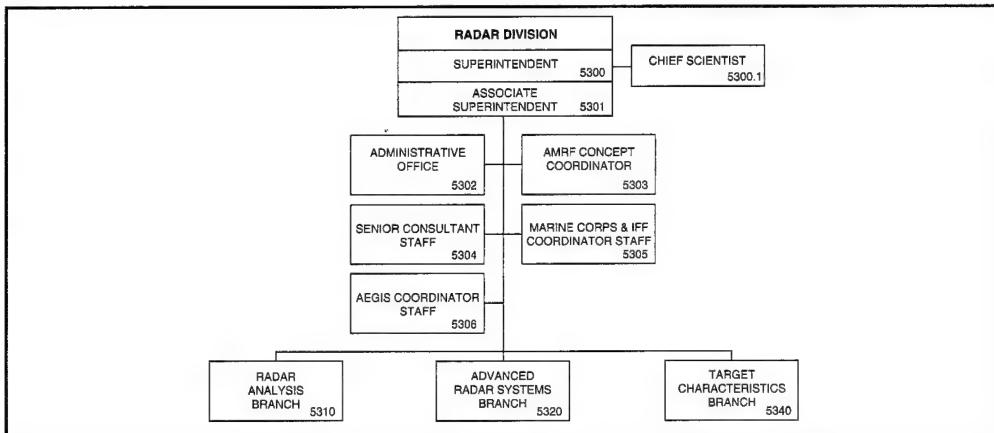
The radiation pattern at a point in time following introduction of a pulse of electromagnetic energy at the feed terminals of the element. This is an output of the electromagnetic computational capabilities of the Radar Division. It allows a researcher to investigate and perfect the performance of a design prior to actually building the element and testing it in an experiment setup, significantly shortening the development cycle.



Some of the experimental radar systems built and employed by the Radar Division. In the right center of the picture are the antenna and trailers of the SPQ-9B Advanced Development Radar. To the left of the antenna are precision mounts used in a variety of experimental setups. In the upper right corner is the antenna mounting platform for the Engagement system, which currently is investigating means of implementing low-cost phased array radar system.



P.K. HUGHES II\*



## Basic Responsibilities

The Radar Division conducts research on basic physical phenomena of importance to radar and related sensors, investigates new engineering techniques applicable to radar, demonstrates the feasibility of new radar concepts and systems, performs related systems analyses and evaluation of radar, and provides special consultative services. The emphasis is on new and advanced concepts and technology in radar and related sensors that are applicable to enhancing the Navy's ability to fulfill its mission.

**Personnel:** 97 full-time civilian

## Key Personnel

Name	Title	Code
Mr. P.K. Hughes II*	Superintendent	5300
Dr. B.H. Cantrell	Chief Scientist	5300.1
Mr. E.E. Maine	Associate Superintendent	5301
Ms. C.A. Hill	Administrative Officer	5302
Mr. G. Tavik	AMRF Concept Coordinator	5303
Mr. E.E. Maine, Jr.	Senior Consultant Staff	5304
Mr. J.A. Pavco	Marine Corps and IFF Coordinator	5305
Mr. V. Gregers-Hansen	AEGIS Coordinator	5306
Dr. W.P. Pala	Head, Radar Analysis Branch	5310
Mr. J.P. Letellier	Head, Advanced Radar Systems Branch	5320
Dr. B.H. Cantrell	Head, Target Characteristics Branch	5340

**Point of contact:** Mr. P.K. Hughes II, Code 5300, (202) 404-2700

\*Acting

# Information Technology Division

## Code 5500 Research Activity Areas

### Navy Center for Applied Research in Artificial Intelligence

Case-based reasoning  
Natural language interfaces  
Intelligent software agents  
Machine learning  
Robotics software and computer vision  
Neural networks  
Novel devices/techniques for HCI  
Voice processing (synthesis, recognition, transmission, etc.)  
Human-in-loop interface evaluation

### Transmission Technology

Arctic communication  
Communication system architecture  
Communication antenna/propagation technology  
Communications intercept systems  
Signal analysis systems  
Virtual engineering

### Center for High Assurance Computer Systems

Security architecture  
Formal specification/verification of system security  
COMSEC application technology  
Secure networks  
Secure databases  
Software engineering for secure systems  
Key management and distribution  
Certification and Infosec Engineering  
Formal methods for requirements specification and verification  
Security product development



Center for Computational Science meta-computer facility

### Communication Systems

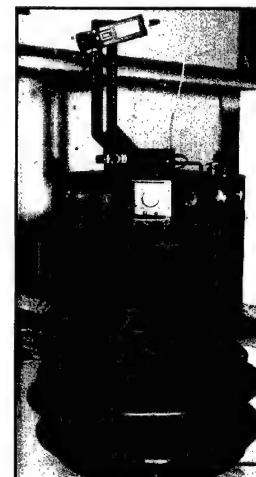
Communication system engineering  
Mobile, wireless networking  
Bandwidth management (quality of service)  
Reliable multicast protocols and applications  
Integrated IP and ATM multicasting  
Communication network simulation  
Phased-array network control  
Policy-based network management  
Tactical voice-over IP  
Next-generation secure voice terminal  
Fastlane and Taclane crypto testing

### Advanced Information Technology

Command decision support  
Parallel computing  
Joint C4ISR and operational M&S systems  
Data fusion technology  
Covariance intersection  
Real-time parallel processing  
Distributed simulation  
Scalable high performance computing  
Processing graph method  
Signal processing applications  
Image processing  
Virtual reality  
Goal-oriented computational steering  
Natural environments for distributed simulation

### Center for Computational Science

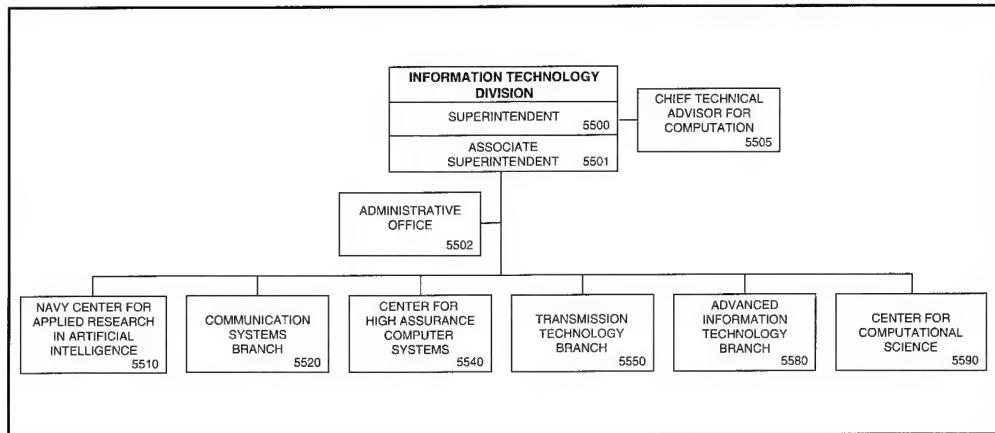
Transparent optical network research and design  
Parallel computing  
Scalable high performance computing  
Distributed computing environments  
Scientific visualization  
Advanced networking streams  
High-definition video technology  
End user support for information technology and operational networks



Mobile robots are used in experiments at the Navy Center for Applied Research in Artificial Intelligence to study sensor-based control and adaptive behavior



DR. R.P. SHUMAKER



## Basic Responsibilities

The Information Technology Division conducts research and development programs in the collection, transmission, and processing of information to provide a basis for improving the conduct of military operations. The organization of the Division is directed toward addressing the technologies and subsystems necessary to develop architectures and system designs for the next-generation battleforce warfare systems.

**Personnel:** 180 full-time civilian

## Key Personnel

Name	Title	Code
Dr. R.P. Shumaker	Superintendent	5500
Mr. W.D. Long	Associate Superintendent	5501
Ms. J. Saunders	Administrative Officer	5502
Dr. H. Dardy	Chief Technical Advisor for Computation	5505
Dr. A.L. Meyrowitz	Director, Navy Center for Applied Research in Artificial Intelligence	5510
Mr. E.L. Althouse	Head, Communication Systems Branch	5520
Dr. J.D. McLean	Director, Center for High Assurance Computer Systems	5540
Mr. E.J. Kennedy	Head, Transmission Technology Branch	5550
Dr. S.K. Numrich	Head, Advanced Information Technology Branch	5580
Mr. J.B. Root	Director, Center for Computational Science	5590

**Point of contact:** Mr. W.D. Long, Code 5501, (202) 767-2954

# Optical Sciences Division

## Code 5600 Staff Activity Areas

Program analysis and development  
Special systems analysis  
Technical study groups

Technical contract monitoring  
Theoretical studies  
Navy Science Assistance Program (NSAP)

## Research Activity Areas

### Infrared Materials and Chemical Sensors

Advanced infrared glasses and fibers  
IR fiber-optic materials and devices  
IR fiber chemical sensors  
Fiber environmental sensors

### Optical Physics

Laser materials diagnostics  
Nonlinear frequency conversion  
Optical instrumentation and probes  
Optical seeker studies  
Optical interactions in semiconductor  
superlattices and organic solids  
Laser-induced reactions  
Beam cleanup technology  
Organic digit emitting devices

### Applied Optics

Detection signal processing studies  
Optical and IR countermeasures  
Optical technology  
Ultraviolet component development and UV  
countermeasures  
Multispectral sensors and processing  
Missile warning sensor technology  
UV, visible, and IR imager development  
Framing reconnaissance sensors  
Micro UAV sensors



The Focal Plane Array Evaluation Facility consists of the optical sources and electronics required to evaluate monolithic or hybrid infrared focal plane arrays that use charge-coupled device, charge-injection device, direct readout, or charge-imaging matrix technologies.

### Photonics Technology

Diode laser applications  
Fiber and solid-state laser/sources  
High-speed (<100 fs) optical probing  
High-power fiber amplifier  
High-speed optical networks  
Antenna remoting  
RF filters and processes  
Photonic control of phased arrays  
Photonic analog to digital conversion

### Advanced Concepts

IR Range Facility  
IR low observables  
Multispectral/hyperspectral/detection algorithms  
EO/IR systems analysis  
Airborne IR search and track technology  
Atmospheric IR measurements  
Ship IR signatures

### Optical Techniques

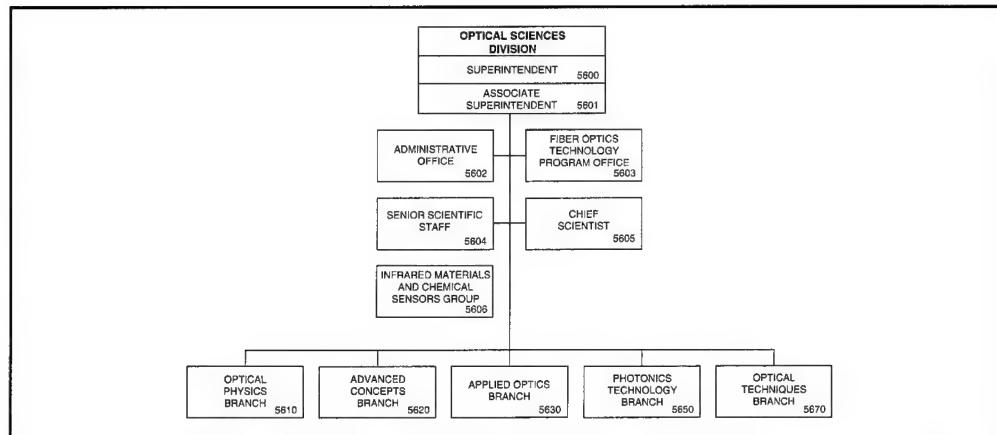
Radiation effects  
Fiber lasers/sources and amplifiers  
Fiber-optic materials and fabrication  
Fiber Bragg grating sensors/systems for smart  
structures  
Fiber-optic sensors/systems (acoustic, magnetic,  
gyroscopes)  
Integrated optics  
Optical sources for sensors



The Missile Seeker Evaluation Facility is a computerized facility that is used to evaluate optical countermeasures to infrared missile seekers and infrared imaging sensors.



DR. T.G. GIALLORENZI



## Basic Responsibilities

The Optical Sciences Division carries out a variety of research, development, and application-oriented activities in the generation, propagation, detection, and use of radiation in the wavelength region between near-ultraviolet and far-infrared wavelengths. The research, both theoretical and experimental, is concerned with discovering and understanding the basic physical principles and mechanisms involved in optical devices, materials, and phenomena. The development effort is aimed at extending this understanding in the direction of device engineering and advanced operational techniques. The applications activities include systems analysis, prototype system development, and exploitation of R&D results for the solution of optically related military problems. In addition to its internal program activities, the Division serves the Laboratory specifically and the Navy generally as a consulting body of experts in optical sciences. The work in the Division includes studies in quantum optics, laser physics, optical waveguide technologies, laser-matter interactions, atmospheric propagation, optical technology, holography, optical warfare, optical data processing, fiber-optic sensor systems, optical systems, optical materials, radiation damage studies, IR surveillance and missile seeker technologies, IR signature measurements, optical recording materials, and optical diagnostic techniques. A significant portion of the effort is devoted to developing, analyzing, and using special optical materials. Various field measurement programs on optical problems of specific interest are also conducted.

**Personnel:** 137 full-time civilian

## Key Personnel

Name	Title	Code
Dr. T.G. Giallorenzi	Superintendent	5600
Dr. C. Hoffman	Associate Superintendent	5601
Ms. M. Webb	Administrative Officer	5602
Mr. G. Cogdell	Head, Fiber Optics Technology Program Office	5603
Dr. J. Reintjes*	Head, Senior Scientific Staff	5604
Vacant	Chief Scientist	5605
Dr. I. Aggarwal	Head, Infrared Materials and Chemical Sensors Group	5606
Dr. A.J. Campillo	Head, Optical Physics Branch	5610
Dr. J.C. Kershenstein	Head, Advanced Concepts Branch	5620
Dr. R.A. Patten	Head, Applied Optics Branch	5630
Dr. R. Esman	Head, Photonics Technology Branch	5650
Dr. A. Dandridge	Head, Optical Techniques Branch	5670

**Point of contact:** Ms. M. Webb, Code 5602, (202) 767-6986

\*Acting

# Tactical Electronic Warfare Division

## Code 5700 Staff Activity Areas

EW Strategic Planning  
Information Warfare Technology Program  
EW Lead Laboratory Coordinator

Navy Science Assistance Program (NSAP)  
Effectiveness of Naval EW Systems (ENEWS)

## Research Activity Areas

### Offboard Countermeasures

Expendable technology and devices  
Unmanned air vehicles  
Offboard payloads  
Decoys

### Advanced Techniques

Analysis and modeling simulation  
New EW techniques  
Experimental systems  
EW concepts  
Infrared technology

### Airborne Electronic Warfare Systems

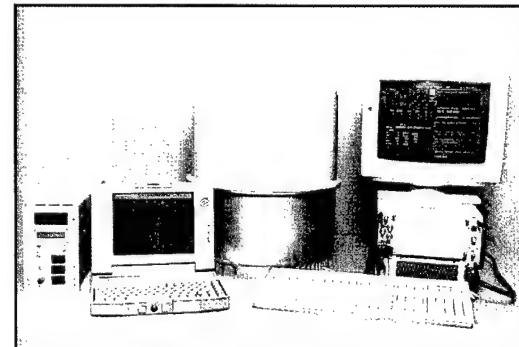
Air systems development  
Penetration aids  
Power source development  
Jamming and deception  
Millimeter-wave technology  
Communications CM

### Integrated EW Simulation

Hardware-in-the-loop simulation  
Data management technology  
Flyable ASM seeker simulators  
Foreign military equipment exploitation

### Ships Electronic Warfare Systems

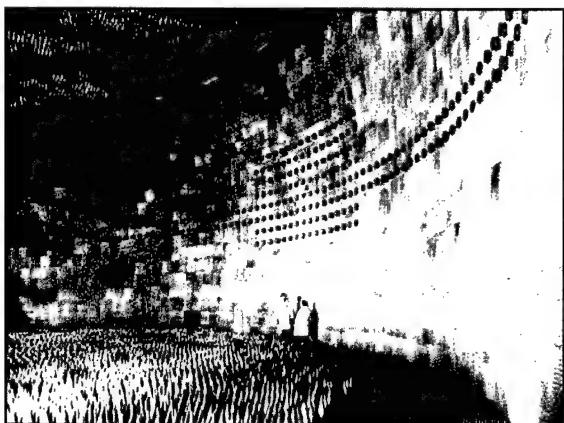
Ships systems development  
Jamming technology  
Deception techniques  
EW antennas



### Electronic Warfare Support Measures

Intercept systems and direction finders  
RF signal simulators  
Systems integration  
Command and control interfaces  
Signal processing

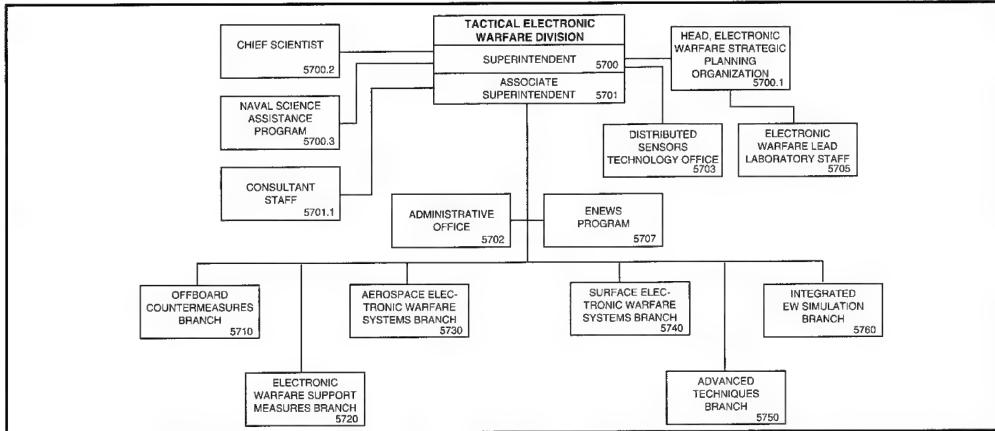
Using the latest composite, MIMIC and processing technologies, the Tactical Electronic Warfare Division has developed a small, lightweight, and inexpensive ESM receiving system for use on frigates, Coast Guard vessels, and various patrol aircraft



The Central Target Simulator (CTS) Programmable Array is part of a large hardware-in-the-loop simulation facility whose purpose is to test and evaluate electronic warfare systems and techniques used to counter the radar guided missile threat to Navy forces



Dr. J.A. MONTGOMERY



## Basic Responsibilities

The Tactical Electronic Warfare Division (TEWD) is responsible for research and development in support of the Navy's tactical electronic warfare requirements and missions. These include electronic warfare support measures, electronic countermeasures, and supporting counter-countermeasures, as well as studies, analyses, and simulations for determining and improving the effectiveness of these systems.

**Personnel:** 217 full-time civilian

## Key Personnel

Name	Title	Code
Dr. J.A. Montgomery	Superintendent	5700
Dr. C.H. Heider	Head, Electronic Warfare Strategic Planning Organization	5700.1
Dr. W.E. Howell	Chief Scientist	5700.2
Ms. S. Bales	Head, Naval Science Assistance Program	5700.3
Mr. A.A. DiMattesa	Associate Superintendent	5701
Mr. A.A. DiMattesa <sup>†</sup>	Consultant Staff	5701.1
Ms. J.C. Johnson	Administrative Officer	5702
Dr. J. Dahlburg	Head, Distributed Sensors Technology Office	5703
Mr. T.J. Jesswein	Head, Electronic Warfare Lead Laboratory Staff	5705
Dr. A.N. Duckworth	Manager, ENEWS Program	5707
Dr. F.J. Klemm	Head, Offboard Countermeasures Branch	5710
Mr. R.D. Oxley	Head, Electronic Warfare Support Measures Branch	5720
Dr. G.A.H. Cowart	Head, Aerospace Electronic Warfare Systems Branch	5730
Dr. J.P. Lawrence	Head, Surface Electronic Warfare Systems Branch	5740
Dr. R.H. Evans	Head, Advanced Techniques Branch	5750
Mr. B.W. Edwards	Head, Integrated EW Simulation Branch	5760

**Point of contact:** Mr. A.A. DiMattesa, Code 5701, (202) 767-5974

<sup>†</sup>Additional duty

# **Materials Science and Component Technology Directorate**

## **MATERIALS SCIENCE AND COMPONENT TECHNOLOGY DIRECTORATE**

### **Code 6000**

The Materials Science and Component Technology Directorate carries out a multidisciplinary research program whose objectives are the discovery and exploitation of new improved materials, the generation of new concepts associated with materials behavior, and the development of advanced components based on these new and improved materials and concepts. Theoretical and experimental research is carried out to determine the scientific origins of materials behavior and to develop procedures for modifying these materials to meet important naval needs for advanced platforms, electronics, sensors, and photonics. The program includes investigations of a broad spectrum of materials including insulators, semiconductors, superconductors, metals and alloys, optical materials, polymers, plastics, and artificially structured bio/molecular materials and composites, which are used in important naval devices, components, and

systems. New techniques are developed for producing, processing, and fabricating these materials for crucial naval applications.

The synthesis, processing, properties, and limits of performance of these materials in natural or radiation environments, components under deleterious conditions such as those associated with the marine environment, neutron or directed energy beam irradiation, or extreme temperatures and pressures, are established.

Additionally, major thrusts are directed in advanced space sensing, reactive flow physics, computational physics, and plasma sciences. Areas of particular emphasis include fluid mechanics and hydrodynamics, nuclear weapon effects simulations, high-energy density storage devices, interactions of various types of radiation with matter, survivability of materials and components, and directed energy devices.

## Associate Director of Research for Materials Science and Component Technology



**D**r. B.B. Rath was born in Banki, India, on October 28, 1934. He received a B.S. degree in physics and mathematics from Utkal University, an M.S. in metallurgical engineering from Michigan Technological University, and a Ph.D. from the Illinois Institute of Technology.

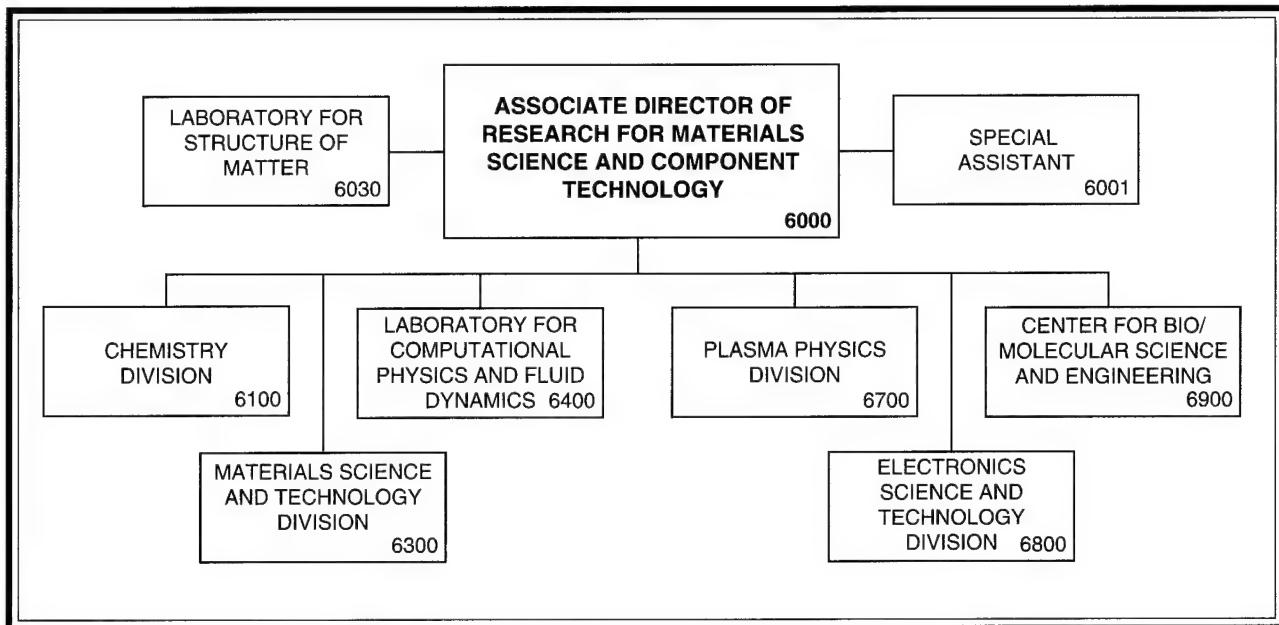
Dr. Rath was Assistant Professor of Metallurgy and Materials Science at Washington State University from 1961 to 1965. From 1965 to 1972, he was with the staff of the Edgar C. Bain Laboratory for fundamental research of the U.S. Steel Corporation. From 1972 to 1976, he headed the Metal Physics Research Group of the McDonnell Douglas Research Laboratories in St.

Louis, Missouri, until he came to NRL as Head of the Physical Metallurgy Branch. During this period, he was adjunct Professor at the Carnegie-Mellon University, the University of Maryland, and the Colorado School of Mines. Dr. Rath served as Superintendent of the Materials Science and Technology Division from 1982 to 1986, when he was appointed to his present position.

Dr. Rath is recognized in the fields of solid-state transformations, grain boundary migrations, and structure-property relationships in metallic systems. He has published over 140 papers in these fields and edited several books and conference proceedings.

Dr. Rath serves on several planning, review, and advisory boards for both the Navy and the Department of Defense, as well as for the National Materials Advisory Board of the National Academy of Sciences, Carnegie-Mellon University, University of Virginia, Colorado School of Mines, University of Pittsburgh, University of Connecticut, University of Maryland, Carnegie-Mellon University, and Florida Atlantic University. He serves as the Navy representative and as the Executive Chair of the Materials and Structures Group of The Technical Cooperation Program (TTCP) countries and the Indo-U.S. Joint Commission on Science and Technology.

Dr. Rath is a fellow of the Minerals, Metals, and Materials Society (TMS), American Society for Materials-International (ASM), Washington Academy of Sciences, Indian Academy of Engineering, and Materials Research Society of India. He has received the 1991 George Kimball Burgess Memorial Award, TMS Leadership Award, the Charles S. Barrett Medal, the Chandrasekhar Medal and Award in 1998, and the Presidential Rank Award in 1999 for his contributions and leadership to Materials Research. He has served as chairperson of several technical committees of TMS, ASM, and AAES, and serves in the editorial boards of three international materials research journals. He is a member of the Board of Trustees of ASM-International and the Federation of Engineering Societies, and Board of Directors of The Materials Society (TMS).



## Key Personnel

Name	Title	Code
Dr. B.B. Rath	Associate Director of Research for Materials Science and Component Technology	6000
Mr. R.A. Gray	Special Assistant	6001
Dr. J. Karle	Chief Scientist, Laboratory for Structure of Matter	6030
Dr. J.S. Murday	Superintendent, Chemistry Division	6100
Dr. D.U. Gubser	Superintendent, Materials Science and Technology Division	6300
Dr. J.P. Boris	Chief Scientist and Director, Laboratory for Computational Physics and Fluid Dynamics	6400
Dr. S.L. Ossakow	Superintendent, Plasma Physics Division	6700
Dr. G.M. Borsuk	Superintendent, Electronics Science and Technology Division	6800
Dr. J. Schnur	Director, Center for Bio/Molecular Science and Engineering	6900

**Point of contact:** Mrs. J. Smithwick, Code 6000A, (202) 767-2538

**Dr. Jerome Karle recipient of  
1985 Nobel Prize in Chemistry**



Dr. Jerome Karle's research has been concerned with diffraction theory and its application to the determination of atomic arrangements in various states of aggregation, gases, liquids, amorphous solids, fibers, and macromolecules. This research has resulted in new techniques for structure determination and a broad variety of applications. His work in crystal structure analysis was recognized by the 1985 Nobel Prize in Chemistry.

Dr. Karle is a Fellow of the American Physical Society, a member of the National Academy of Sciences, and the American Philosophical Society. He has served as president of the International Union of Crystallography, and is a member of a number of other professional societies. He has been chairman of the Chemistry Section of the National Academy of Sciences. Some time ago, he was a Professorial Lecturer in the University College of the University of Maryland and a Visiting Professor at the University of Kiel in Germany. He has also lectured at many international schools and symposia and has served on a number of international scientific organizations.

## Laboratory for Structure of Matter

Code 6030



DR. J. KARLE

### Basic Responsibilities

The Laboratory for Structure of Matter carries out experimental and theoretical investigations of the atomic, molecular, glassy, and crystalline structures of materials. The methods of X-ray, electron, and neutron diffraction are used in a broad program of structural studies that can form the basis for understanding and interpreting the results of research investigations in a wide variety of scientific disciplines. Structural investigations relate structure to function, facilitate industrial syntheses and the creation of new materials with improved properties, and provide foundation information for numerous associated disciplines and studies. Applications are made, for example, to propellants, explosives, dense energetic materials, absorptive carbons, metallic glasses, device materials, ion carriers, antibiotics, analgesics, reversible oxygen carriers, and synthetic reaction intermediates and final products.

**Personnel:** 10 full-time civilian

### Key Personnel

Name	Title	Code
Dr. J. Karle	Chief Scientist	6030

**Point of contact:** Mrs. M. Williams, Code 6030, (202) 767-3496

# Chemistry Division

## Code 6100

### Staff Activity Areas

The Environment and Biotechnology Program Manager

### Research Activity Areas

#### Chemical Diagnostics

- Optical diagnostics of chemical reactions
- Kinetics of gas phase reactions
- Trace analysis
- Atmosphere analysis and control
- Ion/molecule processes
- Environmental chemistry
- Explosive stability

#### Materials Chemistry

- Synthesis and evaluation of innovative polymers
- Functional organic coatings
- Polymer characterization
- Quality control methodology
- Degradation and stabilization mechanisms
- High-temperature resins
- OMCVD materials
- Corrosion prevention
- Mobility fuels

#### Center for Corrosion Science and Engineering

- Materials failure analysis
- Marine coatings
- Cathodic protection
- Corrosion Science
- Environmental fracture and fatigue
- Corrosion control engineering



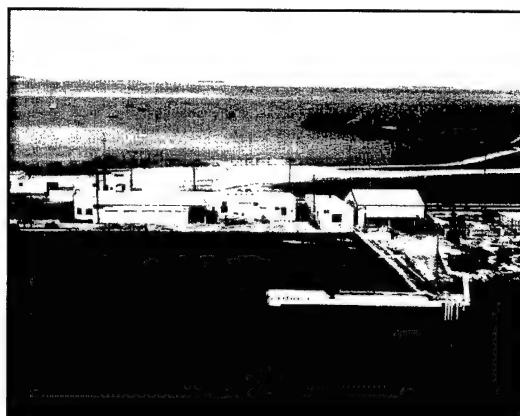
The NRL National Synchrotron Light Source research station for materials and surface research

#### Surface/Interface Chemistry

- Tribology
- Surface properties of materials
- Surface/interface analysis
- Chemical microdetectors
- Surface reaction dynamics
- Diamond films
- Beam-enhanced chemistry
- Electrochemistry
- X-ray sources, optics, and detectors
- X-ray analysis of materials—composition and structure
- Synchrotron radiation applications
- Radiation detection and measurement
- UV optical properties of materials

#### Safety and Survivability

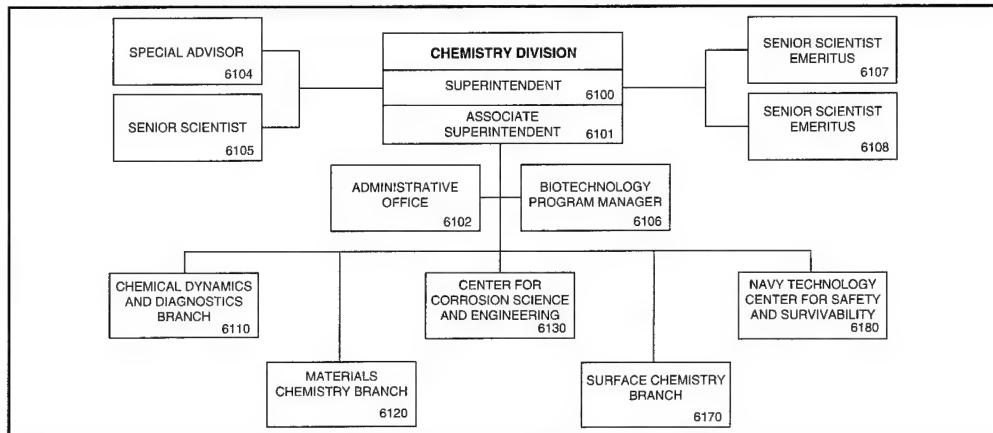
- Combustion dynamics
- Fire protection and suppression
- Personnel protection
- Modeling and scaling of combustion systems
- Chemical and biological defense



The Key West site of the NRL Center for Corrosion Science and Engineering specializes in understanding and modeling of the marine environments impact on Naval materials. A complete laboratory for the study of corrosion control technologies provides sponsors with prototypical seawater exposure of their systems.



DR. J.S. MURDAY



## Basic Responsibilities

The Chemistry Division conducts basic research, applied research, and development studies in the broad fields of chemical/structural diagnostics, reaction rate control, materials chemistry, surface and interface chemistry, corrosion passivation, environmental chemistry, and ship safety/survivability. Specialized programs within these fields include chemical vapor precursors, coatings, functional polymers/elastomers, clusters, controlled release of energy, physical and chemical characterization of surfaces, electrochemistry, properties of nanometer structures, tribology, chemical vapor deposition/etching, atmosphere analysis and control, environmental protection/reclamation, prevention/control of fires, mobility fuels, modeling/simulation, and miniaturized sensors for chemical, biological, nuclear, and radiation hazards.

To enhance protection of Navy personnel and platforms from damage and injury in peace and wartime, the Navy Technology Center for Safety and Survivability performs RDT&E on fire and personnel protection, fuels, chemical defense, submarine atmospheres, and damage control aspects of ship and aircraft survivability; supports Navy and Marine Corps requirements in these areas; and acts as a focus for technology transfer in safety and survivability.

**Personnel:** 115 full-time civilian; 5 full-time military

## Key Personnel

Name	Title	Code
Dr. J.S. Murday	Superintendent	6100
Vacant	Special Assistant	6101
Ms. M.R. Roderick	Administrative Officer	6102
Dr. R. Holst	Special Advisor	6104
Dr. M. Bell	Senior Scientist	6105
CDR A. Churilla, MSC, USN	Biotechnology Program Manager	6106
Dr. D.L. Venezky	Senior Scientist Emeritus	6107
Dr. H.W. Carhart	Senior Scientist Emeritus	6108
Dr. J. McDonald	Head, Chemical Dynamics and Diagnostics Branch	6110
Dr. L. Buckley	Head, Materials Chemistry Branch	6120
Vacant	Head, Center for Corrosion Science and Engineering	6130
Dr. R.J. Colton	Head, Surface Chemistry Branch	6170
Dr. F.W. Williams	Head, Navy Technology Center for Safety and Survivability	6180

**Point of contact:** Ms. M.R. Roderick, Code 6102, (202) 767-2460

# Materials Science and Technology Division

## Code 6300 Research Activity Areas

### Physical Metallurgy

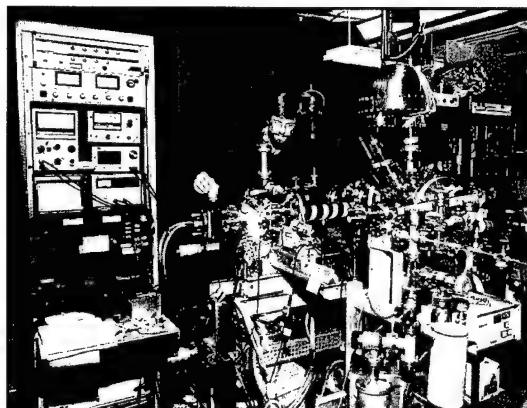
Ferrous and intermetallic alloys  
Synthesis/processing of metals  
Welding technology  
Micro-/nanostructure characterization

### Complex Systems Theory

Computational condensed matter physics and materials science  
Applications of electronic structure theory to solids and clusters  
Molecular dynamics  
Quantum many-body theory  
Theory of alloys  
Superconductivity theory  
Theoretical studies of phase transitions  
Atomic physics theory

### Directed Energy Effects

High-power microwave effects and countermeasures  
Laser-hardened materials and systems  
Laser point defense  
Nanostructure optics  
High-power laser interactions with materials and systems  
Atomic and molecular interactions with surfaces and interfaces  
Spectroscopy of superconductors



The growth of single crystal magnetic films on semiconductor substrates for electronic applications is observed

### Surface Modification

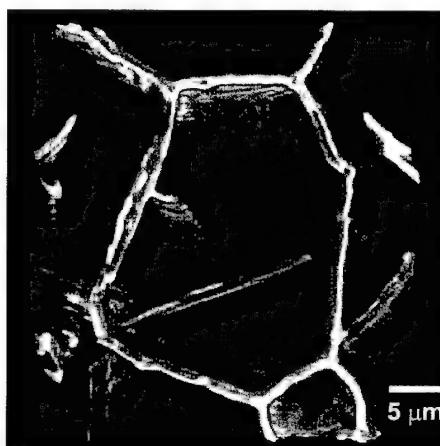
Thin film deposition  
Pulsed laser deposition  
Ion beam assisted deposition  
Variable balance magnetron sputtering  
Ion engineering  
Ion implantation  
Reactive ion etching  
Functional materials  
Optoelectronics  
Electroceramics  
Chemical sensors  
Analysis  
Surface analysis by accelerator techniques  
Trace element accelerator mass spectrometry  
Mechanical loss spectroscopy

### Material Physics

Superconducting materials  
Magnetic materials  
Thermoelectric materials  
Nonlinear (chaotic) phenomena

### Multifunctional Materials

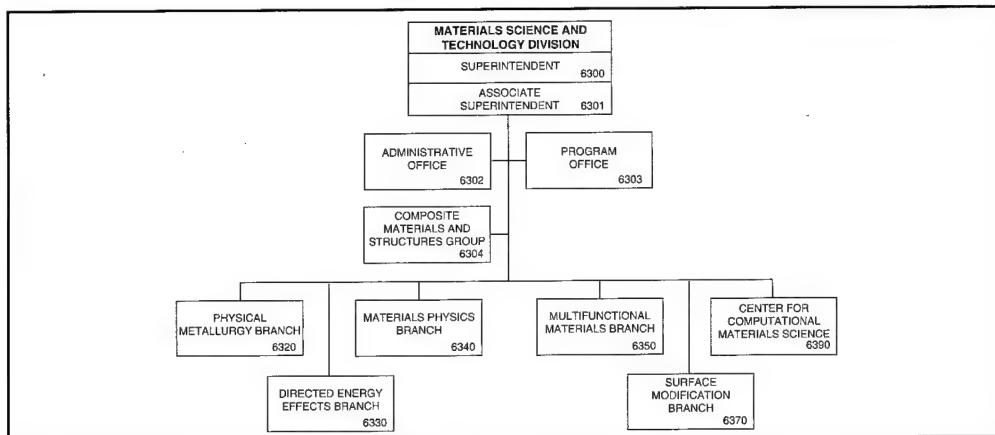
Mechanics of metallic and ceramic materials  
Nondestructive evaluation  
Smart materials/structures  
Synthesis and processing of ceramic materials



3D reconstruction of cementite precipitates in an austenite grain



Dr. D.U. GUBSER



## Basic Responsibilities

The Materials Science and Technology Division conducts basic and applied research and engages in exploratory and advanced development of materials having substantive value to the Navy. R&D programs encompass the intrinsic behavior of metals, insulators, composites, and ceramics, including efforts in ferrous alloys, intermetallic compounds, superconducting, dielectric, and magnetic materials, films and coatings, and multifunctional materials systems. The programs encompass advanced synthesis and process techniques as well as postprocessing techniques to fabricate sensors, devices, structures, and components. A variety of state-of-the-art characterization tools are used to probe the atomic and microstructure nature (composition and structure) of the materials as well as to delineate the fundamental properties of the material or material system. Response of materials and material systems to a variety of external influences (mechanical, chemical, optical, electromagnetic radiation, high-power lasers, temperature, etc.) is integral to the division's programs as well as performances and reliability projections for military service lifetime. The program includes strong theoretical, computational, and simulation efforts to predict, guide, and explain the behavior of materials and materials systems. Studies conducted in the division will provide guidance for the selection, design, certification, and life-cycle management of material in naval vehicles and systems. The diversity of R&D programs in the division is carried out by multidisciplinary teams of materials scientists, metallurgists, ceramists, physicists, chemists, and engineers using the most advanced testing facilities and diagnostic techniques.

**Personnel:** 140 full-time civilian

## Key Personnel

Name	Title	Code
Dr. D.U. Gubser	Superintendent	6300
Dr. D.J. Michel	Associate Superintendent	6301
Mrs. S.A. McIntire	Administrative Officer	6302
Dr. S.C. Sanday	Head, Program Office	6303
Dr. R. Badaliance	Head, Composite Materials and Structures Group	6304
Dr. E.A. Metzbower	Head, Physical Metallurgy Branch	6320
Dr. T. Wieting	Head, Directed Energy Effects Branch	6330
Dr. R. Soulen	Head, Materials Physics Branch	6340
Dr. P. Matic	Head, Multifunctional Materials Branch	6350
Dr. G. Huber	Head, Surface Modification Branch	6370
Dr. D.A. Papaconstantopoulos	Head, Center for Computational Materials Science	6390

**Point of contact:** Ms. J. Schroth, Code 6300A, (202) 767-2926

# Laboratory for Computational Physics and Fluid Dynamics

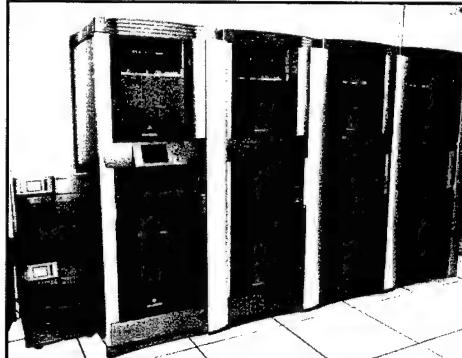
## Code 6400 Research Activity Areas

### Reactive Flows

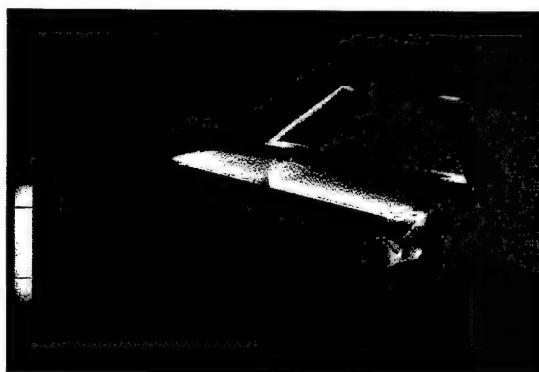
Fluid dynamics in combustion  
Turbulence in compressible flows  
Multiphase flows  
Turbulent jets and wakes  
Turbulence modeling  
Computational hydrodynamics  
Propulsion systems analysis  
Contaminant transport modelling

### Computational Physics Developments

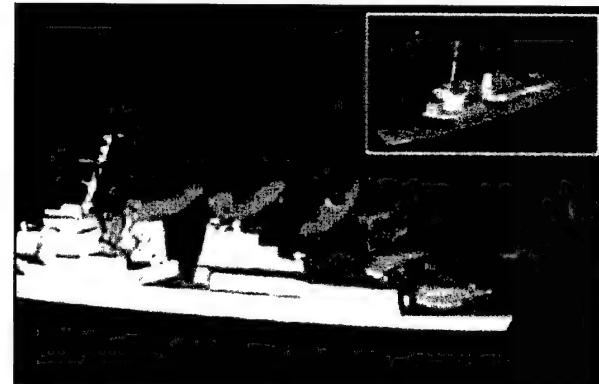
Laser plasma interactions  
Inertial confinement fusion  
Solar physics modeling  
Dynamical gridding algorithms  
Advanced graphical and parallel  
processing systems  
Electromagnetic and acoustic scattering  
Microfluidics  
Fluid structure interaction  
Shock and blast containment



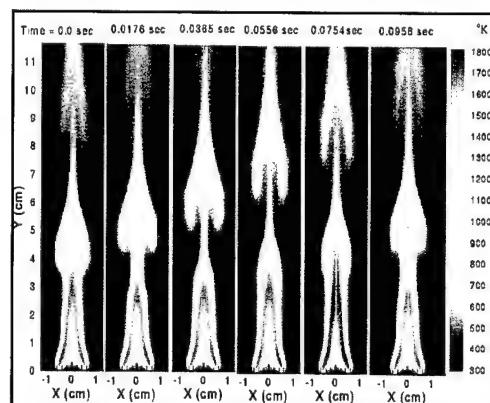
Olive (32P) and Snuffy (24P) — Origins at work



Simulation of flow past a Micro Air Vehicle. Computational Fluid Dynamics is being used to evaluate the aerodynamic performance of alternative concepts. This figure shows the pressure contours on the surface of the vehicle and a symmetry plane.



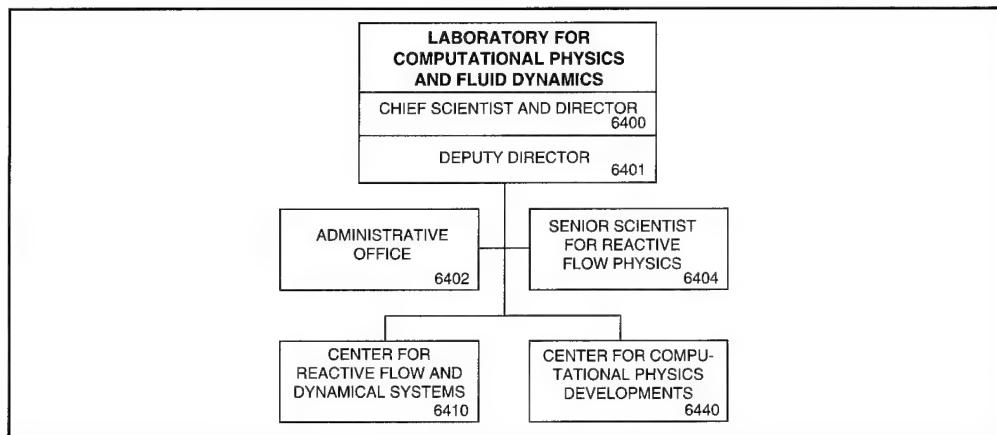
Simulation of temperature isocontours from unsteady airwake simulations over the DDG-51 destroyer were performed in a joint effort with NRL's Tactical Electronic Warfare Division (TEWD).



Temperature distributions from an unsteady simulation of a methanol liquid pool fire. Water mist suppression of such fires and the mechanisms involved have been elucidated using detailed reactive flow simulations.



DR. J.P. BORIS



## Basic Responsibilities

The Laboratory for Computational Physics and Fluid Dynamics is responsible for the research leading to and the application of advanced analytical and numerical capabilities that are relevant to Navy, DoD, and other programs of national interest. This research is pursued in the fields of compressible and incompressible fluid dynamics, reactive flows, fluid/structure interaction including submarine and aerospace applications, atmospheric and solar geophysics, magnetoplasma dynamics for laboratory and space applications, application of parallel processing to large-scale problems such as unstructured grid generation for complex flows and target tracking and correlation for battle management, and in other disciplines of continuum and quantum computational physics as required to further the overall mission of the Naval Research Laboratory. The specific objectives of the Laboratory for Computational Physics and Fluid Dynamics are: to develop and maintain state-of-the-art analytical and computational capabilities in fluid dynamics and related fields of physics; to establish in-house expertise in parallel processing for large-scale scientific computing; to perform analyses and computational experiments on specific relevant problems using these capabilities; and to transfer this technology to new and ongoing projects through cooperative programs with the research divisions at NRL and elsewhere.

**Personnel:** 26 full-time civilian

## Key Personnel

Name	Title	Code
Dr. J.P. Boris	Chief Scientist and Director	6400
Dr. W.C. Sandberg	Deputy Director	6401
Mrs. C. Adams	Administrative Officer	6402
Dr. E.S. Oran	Senior Scientist for Reactive Flow Physics	6404
Dr. K. Kailasanath	Head, Center for Reactive Flow and Dynamical Systems	6410
Mr. J.H. Gardner, Jr.	Head, Center for Computational Physics Developments	6440

**Point of contact:** Mrs. C. Adams, Code 6402, (202) 767-6581

# Plasma Physics Division

## Code 6700 Research Activity Areas

### Radiation Hydrodynamics

Pulsed-power radiation source and power-flow development  
Materials plasma processing  
Dense plasma atomic structure, processes, and equations of state  
Radiation hydrodynamics of dense Z-pinches and laser-produced plasmas  
Plasma-radiation diagnostics  
Numerical simulation of high-density plasma

### Laser Plasma

Nuclear weapons stockpile stewardship  
Laser fusion, inertial confinement  
Megabar high-pressure physics  
Rep-rate KrF laser development  
Strongly coupled plasmas

### Charged Particle Physics

Radiation source development  
Electrodeless plasma discharges for lighting  
Applications of modulated electron beams  
Rocket, satellite, and shuttle-borne natural and active experiments  
Laboratory simulation of space plasma processes

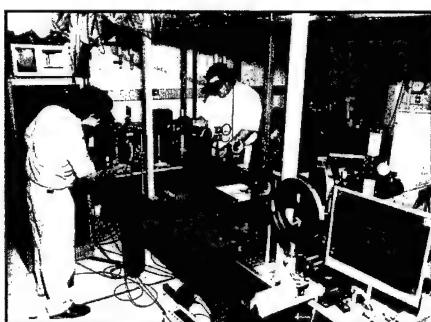
Large area plasma processing sources  
Atmospheric and ionospheric GPS sensing  
Ionospheric radar diagnostics

### Pulsed Power Physics

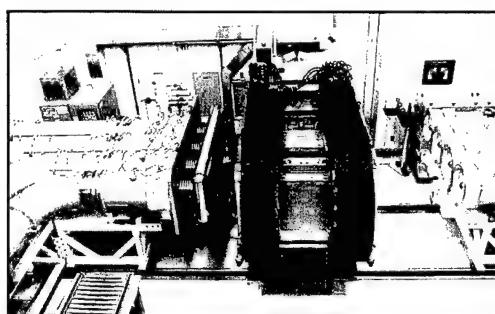
Production of intense relativistic electron and ion beams  
Electron and ion beam propagation and focusing  
Ion beam inertial confinement fusion  
Materials modification by pulsed energy deposition  
Inductive and capacitative energy storage  
Plasma radiator source development

### Beam Physics

Advanced accelerators and radiation sources  
Microwave, plasma, and laser processing of materials  
Microwave sources: Magnicons, gyrotrons, and CARMS  
Ultrahigh intensity laser-matter interactions  
Free electron lasers and laser synchrotrons  
Theory and simulation of space and solar plasmas  
Ionospheric modification  
Space weather modeling  
Rocket and space diagnostics  
Damage effects from laser-generated X rays  
Novel sources for active remote sensing



The NRL Table-Top-Terawatt (T<sup>3</sup>) Laser Facility. The T<sup>3</sup> laser currently operates at 0.4 ps, 2.5 TW and  $5 \times 10^{18} \text{ W/cm}^2$  and provides a facility to conduct research in intense laser-plasma interactions, intense laser-electron beam interactions, and intense laser-matter interactions.

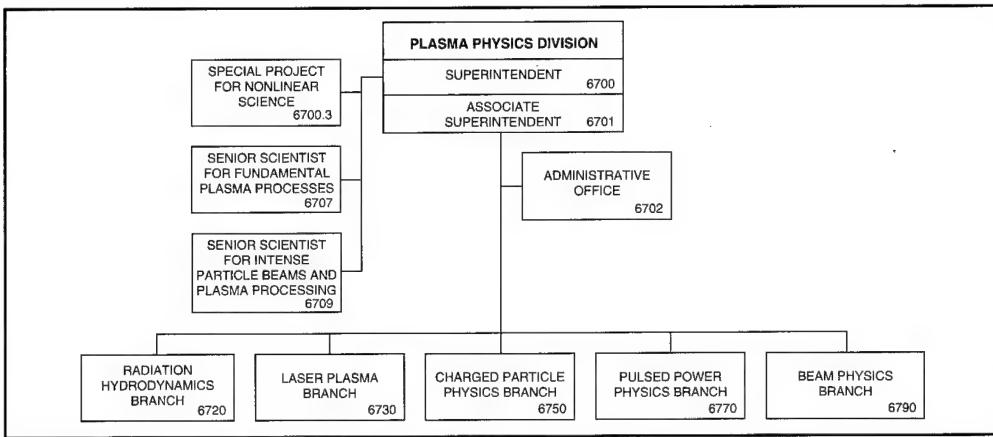


The NIKE Krypton Fluoride (KrF) Laser is in operation to study the physics issues of Direct Drive Inertial Confinement Fusion (ICF) for defense

and energy applications. Direct Drive with a KrF laser is a very attractive approach to ICF owing to its simplicity, inherent high efficiency, and very high-beam uniformity. The NIKE laser illuminates a flat target with intensities of up to  $10^{14} \text{ W/cm}^2$  and beam nonuniformities of less than 0.25%. This photograph shows the largest amplifier in the laser. Light enters and exits the amplifier cell through the square aperture near the center of the photo. Amplification is achieved by exciting the krypton/fluorine mixture gas in the cell with two large area electron beams. One of the electron beam emitters (cathode) is in an exposed position to the left of the cell. The amplifier produces a 248 nm laser beam with total energy of 4-5 kJ.



DR. S.L. OSSAKOW



## Basic Responsibilities

The Plasma Physics Division conducts a broad theoretical and experimental program of basic and applied research in plasma physics, laboratory discharge, and space plasmas, intense electron and ion beams and photon sources, atomic physics, pulsed power sources, laser physics, advanced spectral diagnostics, and nonlinear systems. The effort of the Division is concentrated on a few closely coordinated theoretical and experimental programs. Considerable emphasis is placed on large-scale numerical simulations related to plasma dynamics; ionospheric, magnetospheric, and atmospheric dynamics; nuclear weapons effects; thermonuclear plasma confinement; atomic physics; plasma processing; nonlinear dynamics and chaos; free electron lasers and other advanced radiation sources; and advanced accelerator concepts. Areas of experimental interest include: laser-plasma, laser-electron beam, and laser-matter interactions, thermonuclear fusion, electromagnetic wave generation, the generation of intense electron and ion beams, large area plasma processing sources, high-frequency microwave processing of ceramic materials, high-intensity electrodeless discharge lamps, advanced accelerator development, inductive energy storage, laboratory simulation of space plasma phenomena, and in-situ and remote sensing space plasma measurements.

**Personnel:** 115 full-time civilian

## Key Personnel

Name	Title	Code
Dr. S.L. Ossakow	Superintendent	6700
Dr. V.L. Patel	Associate Superintendent	6701
Dr. P. Palmadesso	Head, Special Project for Nonlinear Science	6700.3
Ms. Tessie Santos	Administrative Officer	6702
Dr. W. Manheimer	Senior Scientist, Fundamental Plasma Processes	6707
Dr. M. Lampe	Senior Scientist, Intense Particle Beams and Plasma Processing	6709
Dr. J. Davis	Head, Radiation Hydrodynamics Branch	6720
Dr. S. Obenschain	Head, Laser Plasma Branch	6730
Dr. R. Meger	Head, Charged Particle Physics Branch	6750
Dr. G. Cooperstein	Head, Pulsed Power Physics Branch	6770
Dr. P. Sprangle	Head, Beam Physics Branch	6790

**Point of contact:** Dr. V.L. Patel, Code 6701, (202) 767-2997

# Electronics Science and Technology Division

## Code 6800 Research Activity Areas

### Electronic Materials

Preparation and development of magnetic, dielectric, optical, and semiconductor materials  
Electrical, optical, and magneto-optical studies of semiconductor microstructures and nano-structures, surfaces, and interfaces  
Impurity and defect studies  
Structural and electronic properties of amorphous semiconductors  
Condensed matter theory  
High magnetic field phenomena

### Surface and Interface Sciences

Metal organic chemical vapor deposition  
Surface and interface physics  
Vacuum surface research  
Processing research for nanometric electronics  
Growth and characterization of micro- and nano-surfaces and interface structures  
High-temperature superconductors

### Microwave Technology

Microwave, millimeter-wave, and submillimeter-wave component and circuit research  
Microwave and millimeter-wave integrated circuits  
Surface acoustic wave devices  
High-frequency device design, simulation, and fabrication  
Ion implantation technology  
Reliability and failure physics of electronic devices and circuits

### Radiation Effects

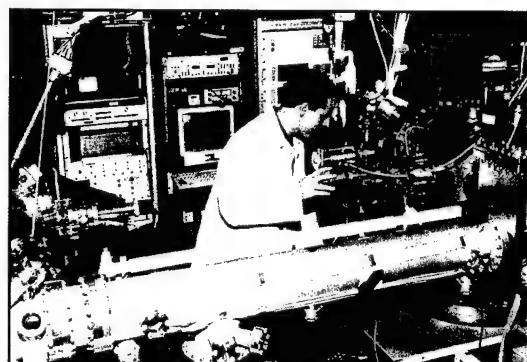
Space experiments  
Single event effects  
Radiation tolerant ultralow-power microelectronics  
Ultrafast charge collection  
Environmental hazard remediation  
Advanced photovoltaic technologies  
Femtosecond laser research  
Radiation effects in microelectronics and photonics  
Material and device damage and hardening  
Satellite survivability

### Solid State Devices

Solid state optical sensors  
Radiation effects/hardening of electronic devices, circuits, and optoelectronic sensors  
Microelectronics device research and fabrication  
Solid state circuits research  
Signal processing research

### Vacuum Electronics

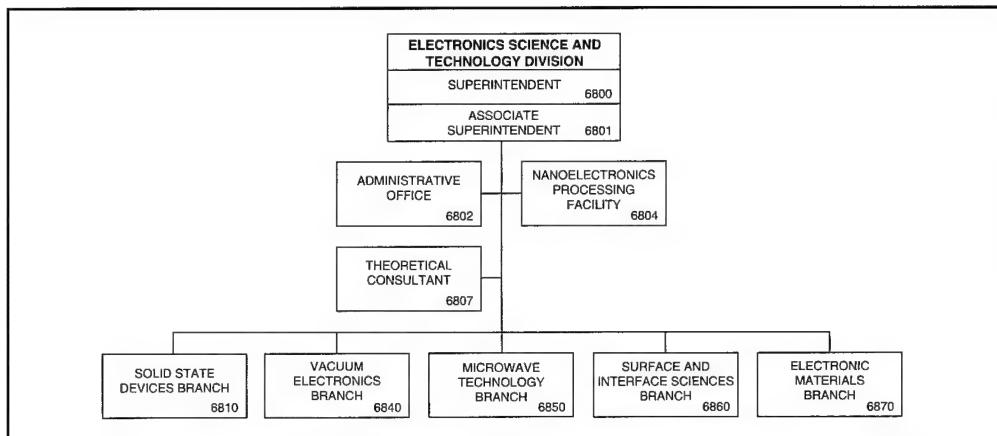
Microwave and millimeter power amplifier research and development  
Cathode research and development  
Thermionic energy conversion  
Field emission arrays  
Vacuum electronic devices  
Tube fabrication and support technology



The EPICENTER specializes in molecular beam epitaxial growth of nanostructures created by alternating layers of narrow bandgap materials made available from four ultrahigh vacuum chambers. These structures are expected to improve the performance of far-infrared detectors, mid-wave lasers, and superhigh frequency transistors and resonant tunneling diodes. Here a scientist in the Electronics Science and Technology Division is shown creating a structure using high vacuum, chamber-to-chamber sample transfer.



DR. G.M. BORSUK



## Basic Responsibilities

The Electronics Science and Technology Division conducts programs of basic science and applied research and development in materials growth and properties, surface physics, micro- and nano- structure electronics, microwave techniques, microelectronic device research and fabrication, vacuum electronics, high-power microwave generation, and cryoelectronics, including superconductors. The activities of the Division couple device research both to basic materials investigations and to systems research and development needs.

**Personnel:** 148 full-time civilian

### Key Personnel

Name	Title	Code
Dr. G.M. Borsuk	Superintendent	6800
Dr. K. Sleger	Associate Superintendent	6801
Mrs. B. Murphy	Administrative Officer	6802
Dr. C.R.K. Marrian	Head, Nanoelectronics Processing Facility	6804
Dr. K.L. Ngai	Theoretical Consultant	6807
Vacant	Head, Solid State Devices Branch	6810
Dr. R.K. Parker	Head, Vacuum Electronics Branch	6840
Dr. D. Webb	Head, Microwave Technology Branch	6850
Dr. M. Peckerar	Head, Surface and Interface Sciences Branch	6860
Dr. B.V. Shanabrook	Head, Electronic Materials Branch	6870

**Point of contact:** Dr. K. Sleger, Code 6801, (202) 767-3894

# Center for Bio/Molecular Science and Engineering

## Code 6900 Research Activity Areas

### Biologically Derived Microstructures

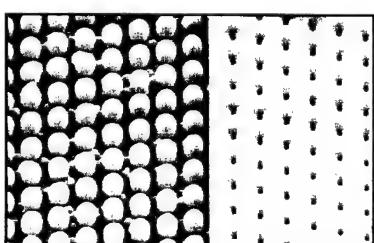
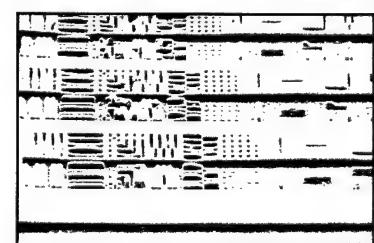
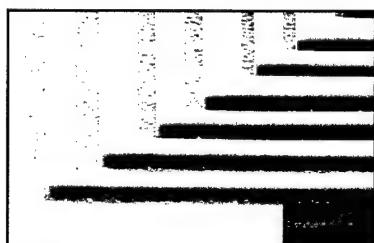
Self-assembly, molecular machining  
Synthetic membranes, molecular printing  
Nanocomposites  
Tailored electronic materials  
Low observables  
Molecular engineering, biomimetic materials

### Biosensors

Binding polypeptides  
Cell-based biosensor  
DNA biosensor  
Fiber-optic biosensor  
Flow immunosensor  
Array-based sensors

### Environmental Quality

Soil/groundwater explosives detection  
Antifouling paint, controlled release



Injection molded patterned micro-  
textured biopolymers are being  
fabricated from  
silicon templates,  
using lithographic tools. These bio-  
materials are being  
explored for use in  
devices, which  
incorporate bio-  
molecules (anti-  
bodies and DNA)  
and biological cells  
for sensor and tissue  
engineering applica-  
tions.

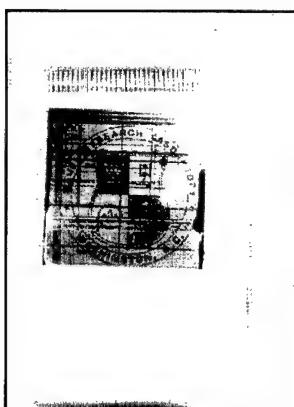
Polyurethanase degradation  
Heavy metal detection  
Heavy metal cleanup  
Hazardous waste neutralization

### Polymers and Liquid Crystals

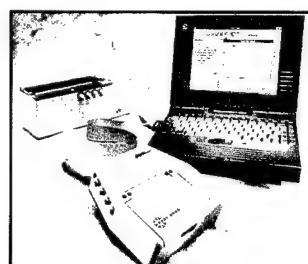
Ferroelectronic liquid crystals  
Advanced materials/information processing  
Flexible displays, noninvasive alignment technique

### Surfaces and Interfaces

Uncooled IR detectors/imagers  
Submicron resists and microlithography  
Specifically activated thin films  
Neuronal patterning



NRL logo shown on a Flexible  
Liquid Crystal display. The  
resolution of the image is 100 dpi.  
The display is rugged, portable, and  
light weight. The applications being  
considered include handheld map  
reader and curved displays for  
cockpits.

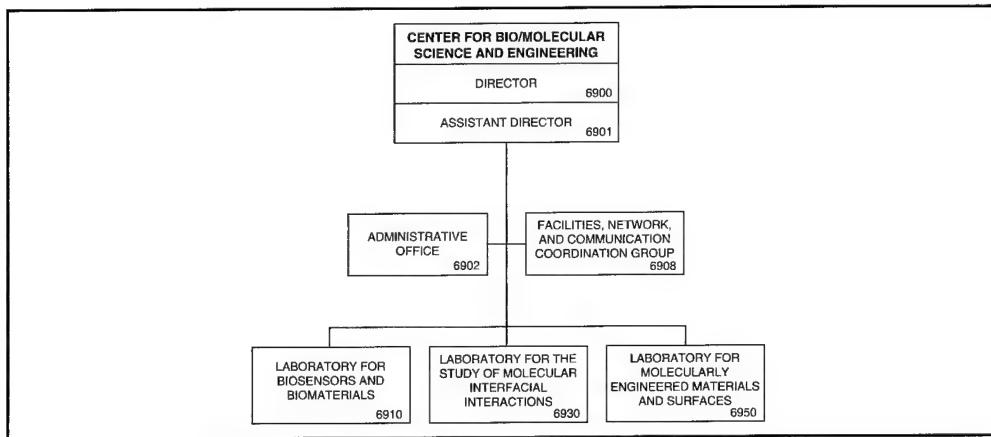


Portable flow immunosensor  
developed for on-site analysis  
of environmental contaminants  
in groundwater and soil

Electron micrograph of lipid tubules,  
showing one complete lipid bilayer  
surrounded by a helically wrapped  
partial bilayer. These self-assembled  
microstructures have applications that include controlled release, field  
emitting cathodes, and electronic obscurants for low observables.



DR. J.M. SCHNUR



## Basic Responsibilities

The Center for Bio/Molecular Science and Engineering is using the tools of modern biology, physics, chemistry, and engineering to develop advanced materials and sensors. The long-term research goal is first to gain a fundamental understanding of the relationship between molecular architecture and the function of materials, then apply this knowledge to solve problems for the Navy and DoD community. The key theme is the study of complex bio/molecular systems with the aim of understanding how "nature" has approached the solution of difficult structural and sensing problems. Technological areas currently being studied include molecular and microstructure design, molecular biology, self-assembly, controlled release and encapsulation, and surface patterning and modification. Much of the research deals with the self-assembly of lipids, proteins, and liquid crystals into complex microstructures for use in advanced material applications, and the harnessing of the recognition functions of proteins and cells for the development of advanced sensors. A highly multidisciplinary staff is required to pursue these research and development programs. The Center provides a stimulating environment for cross-disciplinary programs in the areas of immunology, biochemistry, electrochemistry, inorganic and polymer chemistry, microbiology, microlithography, photochemistry, biophysics, spectroscopy, advanced diagnostics, organic synthesis, and electro-optical engineering.

**Personnel:** 42 full-time civilian

## Key Personnel

Name	Title	Code
Dr. J.M. Schnur	Director	6900
Ms. A. Kusterbeck	Assistant Director	6901
Ms. M. Shorb	Administrative Officer	6902
Mr. D. Zabetakis	Head, Facilities, Network, and Communication Coordination Group	6908
Dr. F.S. Ligler	Head, Laboratory for Biosensors and Biomaterials	6910
Dr. B.P. Gaber	Head, Laboratory for the Study of Molecular Interfacial Interactions	6930
Dr. R. Shashidhar	Head, Laboratory for Molecularly Engineered Materials and Surfaces	6950

**Point of contact:** Ms. M. Shorb, Code 6902, (202) 404-6015

**Ocean and  
Atmospheric  
Science and  
Technology  
Directorate**

## OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE

### Code 7000

The Ocean and Atmospheric Science and Technology Directorate performs research in the fields of acoustics, remote sensing, oceanography, marine geosciences, marine meteorology, and space science. Areas of emphasis in acoustics include advanced acoustic concepts and computation, acoustic signal processing, physical acoustics, acoustic systems, ocean acoustics, and acoustic simulation and tactics. Areas of emphasis in remote sensing include radio, infrared, and optical sensors, remote sensing physics and hydrodynamics, remote sensing simulation, and imaging systems. Areas of emphasis in oceanography include coastal and open ocean dynamics and prediction, coastal and open ocean processes, and remote sensing applications to oceanography. Areas of emphasis in marine geosciences include marine physics,

seafloor sciences, and mapping, charting, and geodesy. Areas of emphasis in marine meteorology include atmospheric dynamics for theater, tactical scale prediction systems and forecast support, and meteorological applications development. Areas of emphasis in space science include ultraviolet measurements, X-ray astronomy, middle and upper atmospheric physics, gamma and cosmic rays, solar physics, and solar terrestrial relationships. Senior naval officers are assigned as military advisors to help maintain the directorate focus on operational Navy and other DoD requirements in these areas of emphasis. The directorate is responsible for administrative and technical support to major activities in Washington, DC; Stennis Space Center, Mississippi; and Monterey, California.

## Associate Director of Research for Ocean and Atmospheric Science and Technology\*



**D**r. E.R. Franchi was born in Huntington, New York on October 19, 1946. He graduated from Clarkson University in 1968 with a B.S. degree in mathematics, and obtained his M.S. degree (1970) and Ph.D. (1973), both in applied mathematics, from Rensselaer Polytechnic Institute. His thesis research involved the development of environmental acoustic models to describe underwater sound transmission through moving media.

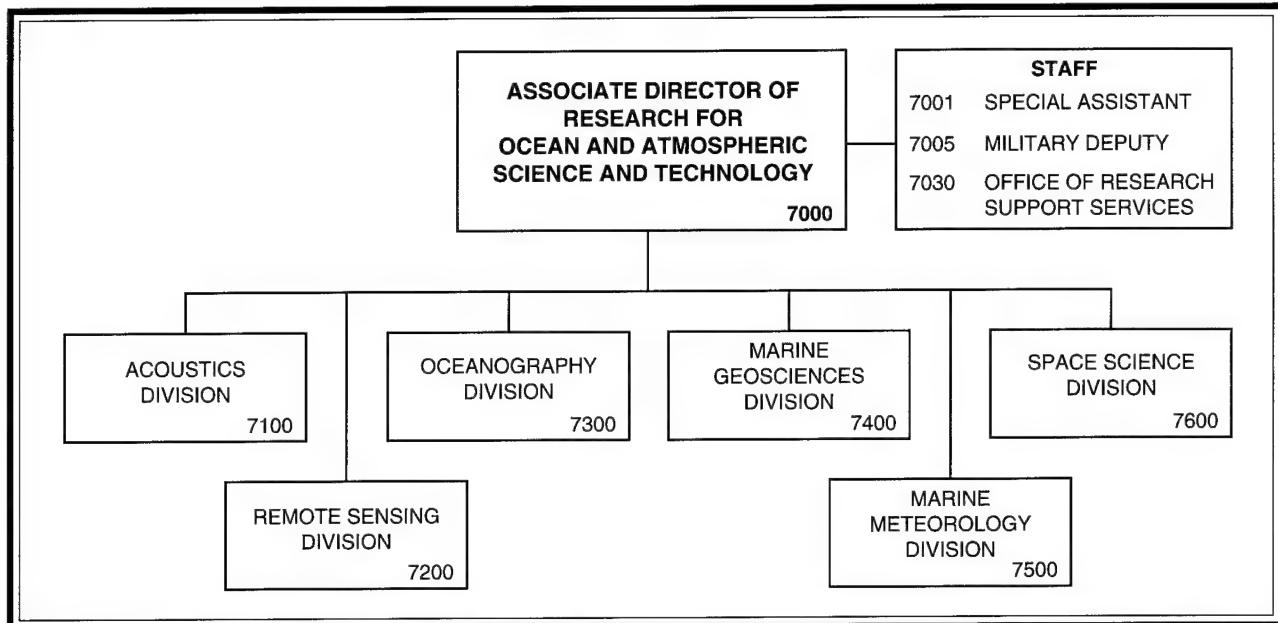
As a senior scientist at Bolt, Beranek, and Newman, Inc. (1973-1975), he was involved in theoretical investigations and experimental measurements of underwater acoustic propagation, ambient noise, and volume reverberation.

Dr. Franchi joined the Naval Research Laboratory in 1975 as a research mathematician in the Acoustics Division. In this position, he conducted and directed research in low frequency acoustic reverberation and scattering, including design and conduct of field experiments, development of signal processing techniques, data analysis and interpretation, computer prediction models, and active sonar performance studies. In 1986, he was named Head of the Acoustics Systems Branch where he was responsible for programs that emphasized theoretical, experimental, and computational research to understand the physical mechanisms of acoustic propagation, scattering, and ambient noise that control the design and performance of large aperture passive sonar systems, low frequency active sonar systems, and shallow water sonar systems.

In July 1988, Dr. Franchi was selected as the Associate Technical Director of the Naval Ocean Research and Development Activity and its Director of Ocean Acoustics and Technology. The Directorate conducted basic, exploratory, and advanced research and development and program management in the areas of acoustic model development and simulation, ocean acoustics measurements, and ocean engineering in support of all undersea warfare missions. In October 1992, the Directorate became the Center for Environmental Acoustics in the Acoustics Division of the Naval Research Laboratory, with Dr. Franchi as Director. Dr. Franchi became Superintendent of the Acoustics Division in 1993. He assumed his current position of Acting Associate Director of Research for the Ocean and Atmospheric Science and Technology Directorate in October 2001.

Dr. Franchi is recognized as an authority on underwater acoustic scattering and reverberation and has played a major role in the Navy's development of low frequency active sonar programs. He is the author or co-author of over 35 publications. He is a member of the Acoustical Society of America and the Mathematical Association of America.

\*Acting



## Key Personnel

Name	Title	Code
Dr. E.R. Franchi*	Associate Director of Research for Ocean and Atmospheric Science and Techology	7000
Mrs. P.A. Dixon	Special Assistant	7001
CDR E. Long, USN	Military Deputy	7005
Mr. G.R. Bower	Head, Office of Research Support Services	7030
Dr. J.A. Bucaro*	Superintendent, Acoustics Division	7100
LCDR S.P. Sopko, USN	Naval Science (Acoustic) Research Coordinator	7105
Dr. P. Schwartz	Superintendent, Remote Sensing Division	7200
LCDR C.A. Weddle, USN	Military Deputy	7205
Dr. W. Jobst	Superintendent, Oceanography Division	7300
CDR R. Robichaud, USN	Military Deputy	7305
Dr. H.C. Eppert, Jr.	Superintendent, Marine Geosciences Division	7400
LCDR C. King, USN	Military Deputy	7405
Dr. P.E. Merilees	Superintendent, Marine Meteorology Division	7500
CDR K. Bedell, USN	Military Deputy	7505
Dr. H. Gursky	Superintendent, Space Science Division	7600

**Point of contact:** Ms. L.M. Trader, Code 7000A, (202) 404-8174

\*Acting

# Office of Research Support Services

## Code 7030 Staff Activity Areas

### Office of Research Support

Conference coordination, video teleconferencing  
Data communications  
Data networking  
Computer network maintenance

### Security Office

Information security  
Physical security  
Industrial security  
AIS security  
Personnel security  
Classification  
SCIF management  
Security investigations  
Navy message center  
Classified material control

### HPC Management Office

Supercomputing interface management

### Safety/Environmental Office

Industrial/laboratory safety  
Specialized safety training  
Hazard abatement  
Mishap prevention  
Hazardous materials program  
Hazardous waste disposal

### Public Affairs Office

Community relations  
News releases  
Exhibits  
Information  
Freedom of Information Act

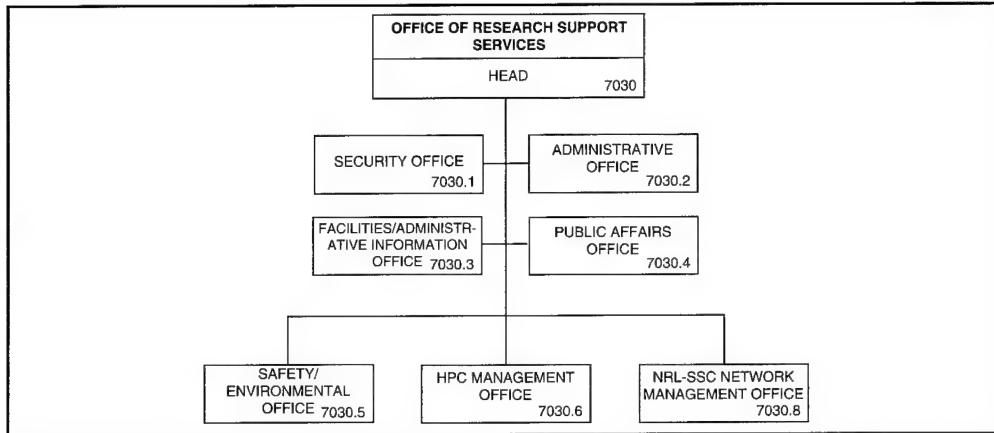
### Facilities/Administrative Information

#### Office

Directives, reports, forms  
Mail management  
Facilities planning  
Vehicles  
Shipment via FedEx and common carriers



Mr. G.R. BOWER



## Basic Responsibilities

The Office of Research Support Services is responsible for the operational and management support necessary for the day-to-day operations at NRL Stennis Space Center, Mississippi (NRL-SSC). The Head of NRL-SSC acts for the Commanding Officer in dealing with local Naval, Federal, and civil activities and personnel on matters relating to NRL-SSC support activities and facilities, community and multicommand issues, and safety and disaster control measures.

Support functions include security, public affairs, safety, high-performance computer management, and support services to include management, administration, and facilities.

**Personnel:** 15 full-time civilian

## Key Personnel

Name	Title	Code
Mr. G.R. Bower	Head	7030
Mr. R.H. Swanton	Head, Security Office	7030.1
Ms. C.L. Gilroy	Administrative Officer	7030.2
Mr. W.B. Eslick	Head, Facilities/Administrative Information Office	7030.3
Ms. M.P. Rotundo	Public Affairs Office	7030.4
Mr. K.H. Geistfeld	Head, Safety/Environmental Office	7030.5
Ms. M. Frommeyer	HPC Management Office	7030.6
Mr. K.O. Davis	NRL-SSC Network Management Office	7030.8

**Point of contact:** Mr. G.R. Bower, Code 7030, (228) 688-4010; DSN 828-4010

# Acoustics Division

## Code 7100 Staff Activity Areas

Special programs management  
System concepts and studies

*USN Journal of Underwater Acoustics*

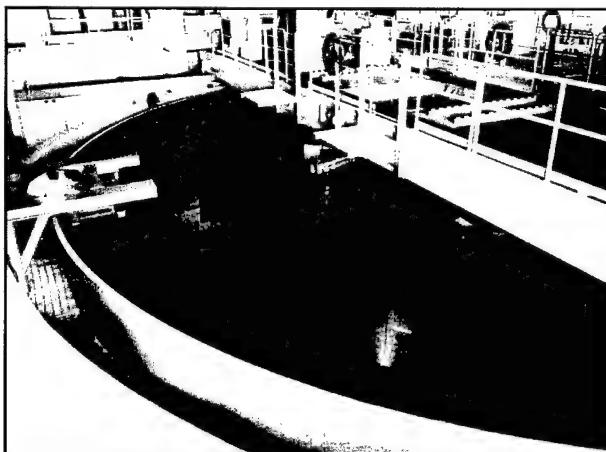
## Research Activity Areas

### Acoustic Signal Processing

Random media propagation  
Limits of acoustic array performance  
Underwater acoustic communications  
Undersea noise signal characterization and modeling  
Surf zone noise generation  
Shallow water acoustic surveillance methods  
Fish absorption of acoustic signals  
Geophysical inversion  
Matched field processing and inversion  
High-frequency acoustic flow visualization

### Physical Acoustics

Structural acoustics  
Active sound control  
Fiber-optic acoustic sensors  
Acoustics of coatings  
Dynamics of complex structures  
Target strength/radiation modeling  
Acoustic transduction  
Inverse scattering  
Nanomicrostructure dynamics



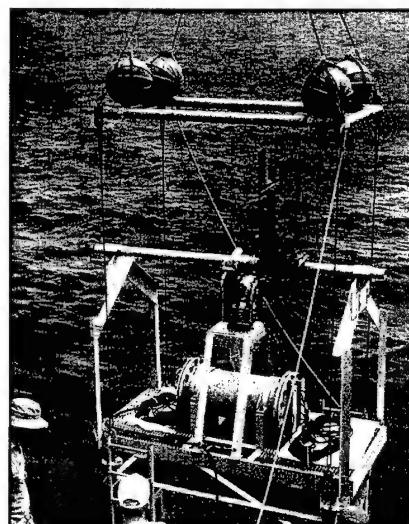
Structural acoustic studies in the one-million gallon Acoustic Holographic Pool Facility

### Acoustic Systems

Ocean boundary scattering  
Shallow water active classification  
Statistical characterization of reverberation  
Active sonar performance modeling  
Matched field processing  
Acoustic inversion techniques  
Acoustic propagation  
Nonlinear signal propagation  
Acoustics of bubbly media

### Acoustic Simulation, Measurements, and Tactics

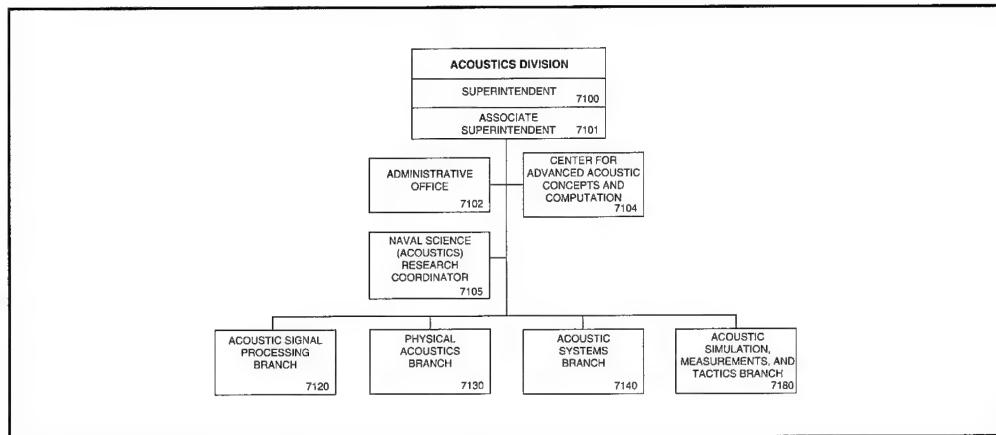
Coupled dynamic ocean and acoustic modeling  
Ocean acoustic propagation and scattering models  
Ocean ambient noise models and simulation  
Superconductor and scalable acoustic models  
Fleet application acoustic models  
Environmental acoustic assessments and characterizations  
High-frequency seafloor and ocean acoustic measurements  
Coastal acoustic measurements and studies  
Biologic ocean volume reverberation measurements  
Multisensor system optimization  
Tactical oceanography simulations and data bases  
Warfare effectiveness studies and optimizations



Deployment of high-frequency acoustics tower



Dr. J.A. BUCARO\*



## Basic Responsibilities

The Acoustics Division conducts basic and applied research in undersea physics. The basic research areas are signal processing; ocean acoustics and the associated description of the ocean environment as it impacts advanced systems; and physical acoustics. The applied spectrum includes developing and proving system concepts; signal processing for active and passive detection, tracking, and classification of underwater targets; echo strength; structural acoustics; large area assessment techniques; and development of processing systems and techniques. Also included are basic and applied research in simulations and tactics as influenced by the environment. The Division program is interactive with the ONR Contract Research Program and other research laboratories, both U.S. and foreign.

**Personnel:** 105 full-time civilian; 1 full-time military

## Key Personnel

Name	Title	Code
Dr. J.A. Bucaro*	Superintendent	7100
Vacant	Associate Superintendent	7101
Mr. J. Tomlinson	Administrative Officer	7102
Vacant	Head, Center for Advanced Acoustic Concepts and Computation	7104
LCDR S.P. Sopko, USN	Naval Science (Acoustics) Research Coordinator	7105
Dr. M.H. Orr	Head, Acoustic Signal Processing Branch	7120
Dr. J.A. Bucaro	Head, Physical Acoustics Branch	7130
Mr. L.B. Palmer	Head, Acoustic Systems Branch	7140
Dr. S.A. Chin-Bing	Head, Acoustic Simulation, Measurements, and Tactics Branch	7180

**Point of contact:** Dr. J.A. Bucaro, Code 7100, (202) 767-3482

\*Acting

# Remote Sensing Division

## Code 7200 Research Activity Areas

### Remote Sensing

#### Sensors

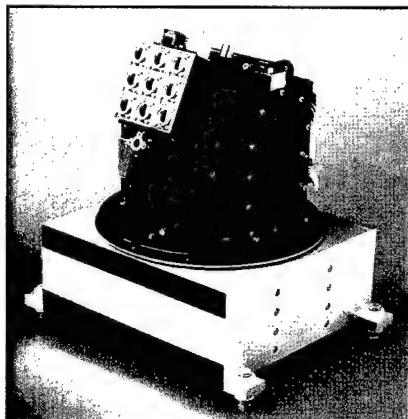
- SAR
- Imaging RAR
- Passive microwave imagers
- CCDs and focal plane arrays
- Fabry-Perot spectrometers
- Imaging spectrometers
- Radio interferometers
- Optical interferometers
- Lidar
- Spaceborne and airborne systems

#### Areas

- Radiative transfer modeling
- Coastal oceans
- Marine ocean boundary layer
- Polar ice
- Middle atmosphere
- Global ocean phenomenology
- Environmental change
- Ocean surface wind vector
- Ionosphere

### Astrophysics

- Optical interferometry
- Radio interferometry
- Fundamental astrometry and reference frames
- Fundamental astrophysics
- Star formation
- Stellar atmospheres and envelopes
- Interstellar medium, interstellar scattering
- Pulsars
- Low-frequency astronomy



Optical Head Assembly (OHA) of the Polar Ozone and Aerosol Measurement (POAM-II) experiment payload

### Physics of Atmospheric/Ocean Interaction

- Mesoscale, fine-structure, and microstructure
- Aerosol and cloud physics
- Mixed layer and thermocline applications
- Sea-truth towed instrumentation techniques
- Turbulent jets and wakes
- Nonlinear and breaking ocean waves
- Stratified and rotating flows
- Turbulence modeling
- Boundary layer hydrodynamics
- Marine hydrodynamics
- Computational hydrodynamics

### Imaging Research/Systems

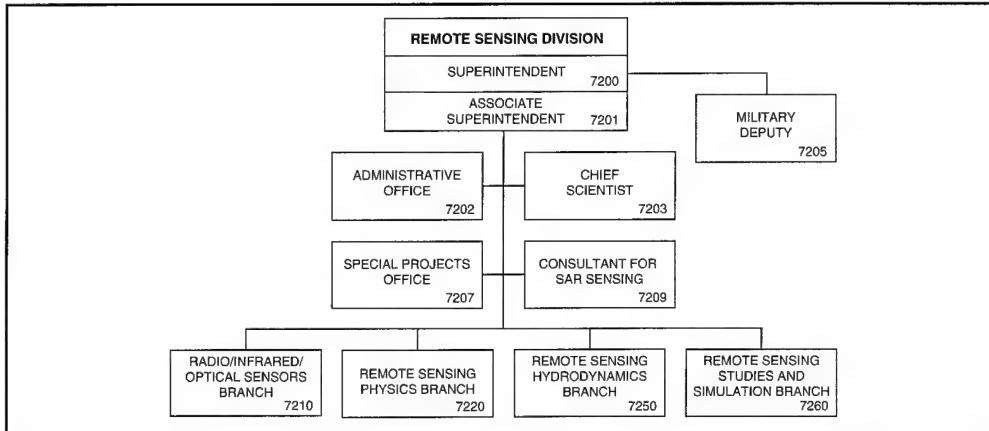
- Remotely sensed signatures analysis/simulation
- Real-time signal and image processing algorithm/systems
- Image data compression methodology
- Image fusion
- Automatic target recognition
- Scene/sensor noise characterization
- Image enhancement/noise reduction
- Scene classification techniques
- Radar and laser imaging systems studies
- Coherent/incoherent imaging sensor exploitation
- Numerical modeling simulation
- Environmental imagery analysis



The Navy Prototype Optical Interferometer produces the highest angular resolution images ever made at optical wavelengths. Its four astrometric elements (the rectangular huts) provide extremely precise star positions for use by the U.S. Naval Observatory in navigation and time keeping. The imaging elements are mounted on piers extending out the "Y" configuration. Light from all the telescopes is carried down evacuated pipes and combined in the optics laboratory to produce images of stellar surfaces.



DR. P.R. SCHWARTZ



## Basic Responsibilities

The Remote Sensing Division conducts a program of basic research, science, and applications aimed at the development of new concepts for sensors and imaging systems for objects and targets on the Earth, in the near-Earth environment, and in deep space. The research, both theoretical and experimental, deals with discovering and understanding the basic physical principles and mechanisms that give rise to target and background emission and to absorption and emission by the intervening medium. The accomplishment of this research requires the development of sensor systems technology. The development effort includes active and passive sensor systems to be used for the study and analysis of the physical characteristics of phenomena that give rise to naturally occurring background radiation, such as that caused by the Earth's atmosphere and oceans, as well as man-made or induced phenomena such as ship/submarine hydrodynamic effects. The research includes theory, laboratory, and field experiments leading to ground-based, airborne or space systems for use in such areas as remote sensing, astrometry, astrophysics, surveillance, nonacoustic ASW, and improved meteorological support systems for the operational Navy. Special emphasis is given to developing space-based platforms and exploiting existing space systems.

**Personnel:** 89 full-time civilian; 1 full-time military

## Key Personnel

Name	Title	Code
Dr. P.R. Schwartz	Superintendent	7200
Mr. C.W. Hoffman	Associate Superintendent	7201
Mrs. M.K. Smith	Administrative Officer	7202
Dr. C.O. Davis	Chief Scientist	7203
LCDR C.A. Weddle, USN	Military Deputy	7205
Dr. D.T. Chen	Head, Special Projects Office	7207
Dr. S.A. Mango	Consultant for SAR Sensing	7209
Dr. L. Rickard	Head, Radio/Infrared/Optical Sensors Branch	7210
Dr. R. Bevilacqua	Head, Remote Sensing Physics Branch	7220
Dr. R. Mied	Head, Remote Sensing Hydrodynamics Branch	7250
Dr. Dr. R. Fiedler	Head, Remote Sensing Studies and Simulation Branch	7260

**Point of contact:** Dr. P.R. Schwartz, Code 7200, (202) 767-2351

# Oceanography Division

## Code 7300 Staff Activity Areas

Special studies

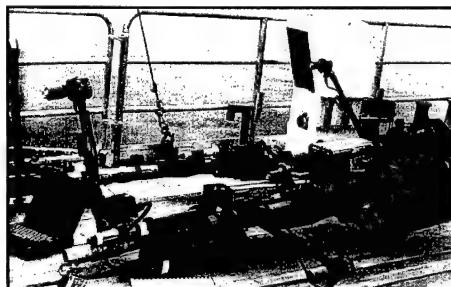
### Research Activity Areas

#### Ocean Dynamics and Prediction

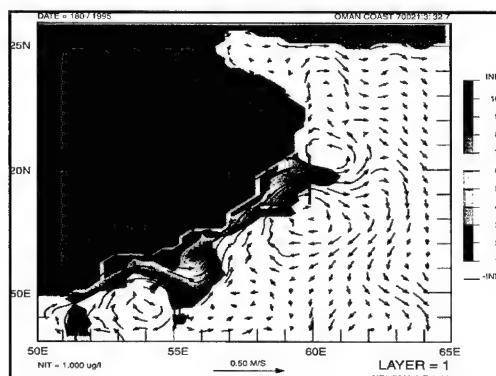
Ocean prediction  
Large scale  
Arctic  
Shipboard  
Data assimilation  
Coastal and semi-enclosed sea  
Ocean observing system simulation  
Coastal scene generation

#### Ocean Sciences

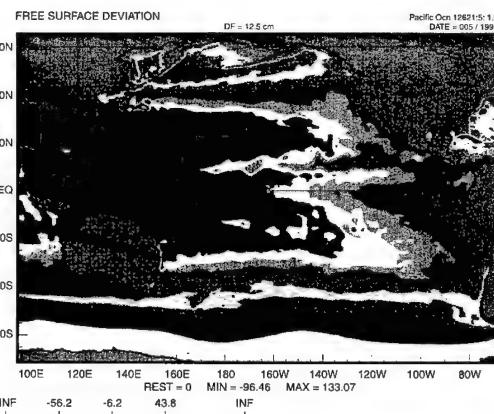
Dynamical processes  
Coastal current systems  
Waves and bubbles  
Coupled systems  
Air/ocean/acoustic coupling  
Biodynamics  
Remote sensing applications  
Color/hyperspectral signatures  
Ocean optics



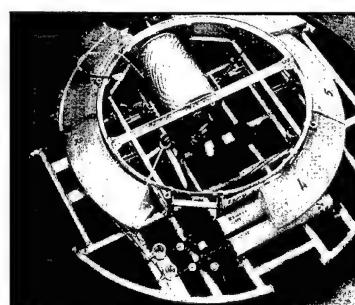
Optical mooring equipment for shallow water showing attenuation and absorption meters and irradiance sensors



Gulf of Mexico NOAA AVHRR Sea Surface Temperature Image illustrating the mesoscale and shelf processes. The position of the warm Loop current (dark) is shown in the eastern gulf. NRL collects and processes all AVHRR and SeaWiFS imagery to understand the dynamics and evolution of oceanographic events that affect our coastal waters. Imagery can be viewed on the NRL, SSC website.



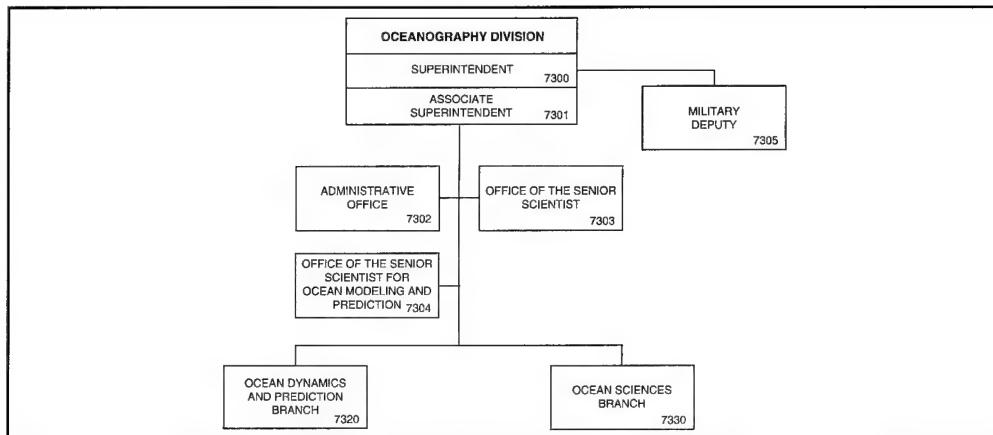
NRL layered ocean model output of sea surface height for Pacific Ocean, 5 January 1995. This model has been transitioned to NAVOCEANO.



NRL's ten 300 kHz ADCPs are matched with trawl-resistant bottom mounts. This photo shows a bottom mount with its exterior fiberglass shell and some internal buoyancy segments removed. The internal recording instruments collect frequent profiles of horizontal current for intervals of up to several months. A wave and tide gauge may also be included in the housing. With an operating depth of 300 m, the instruments permit operations nearly every-where on the world's continental shelves.



DR. W.J. JOBST



## Basic Responsibilities

The Oceanography Division conducts basic and applied research in biological, physical, and dynamical processes and their description and modeling in open ocean, coastal, and semi-enclosed seas; exploiting satellite and airborne sensors for environmental information; investigation and application of microbiological processes to Navy problems. The oceanographic research is both theoretical and experimental in nature and is focused on understanding and modeling ocean, coastal, and littoral area hydro/thermodynamics, circulation, waves, ice dynamics, air-sea exchange, optics, and small and microscale processes. Analytical methods and algorithms are developed to provide quantitative retrieval of geophysical parameters of Navy interest from state-of-the-art sensor systems. The Division work includes analysis of biological processes that mediate and control bioluminescence distributions in the oceans, coastal, and littoral regions and microbially induced corrosion/metal microbe interaction. The Division programs are designed to be responsive to and to anticipate Naval needs. Transition of Division products to the Department of Defense (DoD), Navy systems developers, operational Navy and civilian (dual use) programs is a primary goal. The Division's programs are coordinated and interactive with other NRL programs and activities, ONR's research programs, and other government agencies involved in oceanographic activities. The Division also collaborates and cooperates with scientists from the academic community and other U.S. and foreign laboratories.

**Personnel:** 73 full-time civilian; 1 full-time military

## Key Personnel

Name	Title	Code
Dr. W.J. Jobst	Superintendent	7300
Vacant	Associate Superintendent	7301
Mrs. I.S. DeSpain	Administrative Officer	7302
Dr. B.J. Little	Office of Senior Scientist	7303
Dr. H.E. Hurlburt	Office of Senior Scientist	7304
CDR R.M. Robichaud, Jr., USN	Military Deputy	7305
Dr. J.M. Harding	Head, Ocean Dynamics and Prediction Branch	7320
Mr. S. Payne	Head, Ocean Sciences Branch	7330

**Point of contact:** Mrs. I.S. DeSpain, Code 7302, (228) 688-4114; DSN 828-4114

# Marine Geosciences Division

## Code 7400 Research Activity Areas

### Marine Geology

Sedimentary processes  
Foreshore sediment transport  
Sediment microstructure  
Pore fluid flow  
Diapirism, volcanism, faulting, mass movement  
Early sediment diagenesis  
Biogenic and thermogenic methane  
Hydrate distribution, formation and dissociation

### Marine Geophysics

Seismic wave propagation  
Earthquake seismology  
Physics of low-frequency acoustic propagation  
Acoustic energy interaction with topography and inhomogeneities  
Gravimetry and geodesy  
Geomagnetic modeling

### Marine Geotechnique

Acoustic seafloor characterization  
Geoacoustic modeling  
Geotechnical properties and behavior of sediments  
Measurement and modeling of high frequency acoustic propagation and scattering  
Bottom mine topography  
Mine burial processes

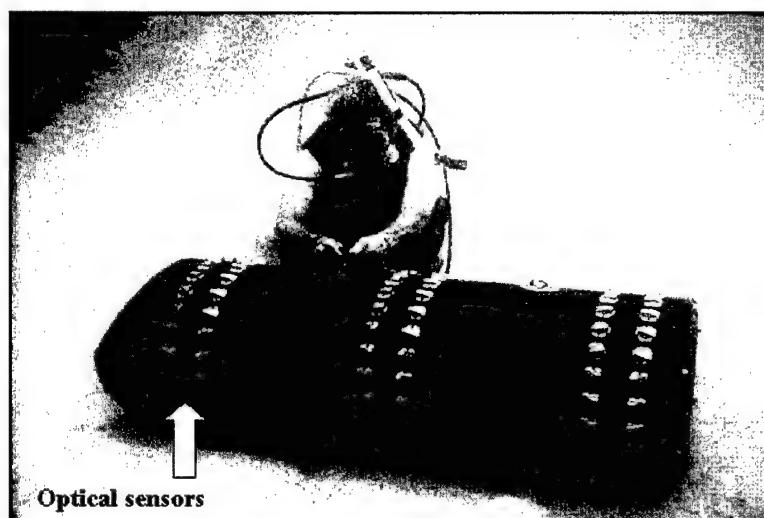
### Mapping and Charting

Digital database design  
Digital product analysis and standardization  
Data compression techniques and exploitation  
Hydrographic survey techniques  
Bathymetry extraction techniques from remote and acoustic imagery  
Utility software development for digital mapping databases

Observation and modeling of nearshore morphodynamics

### In Situ and Laboratory Sensors

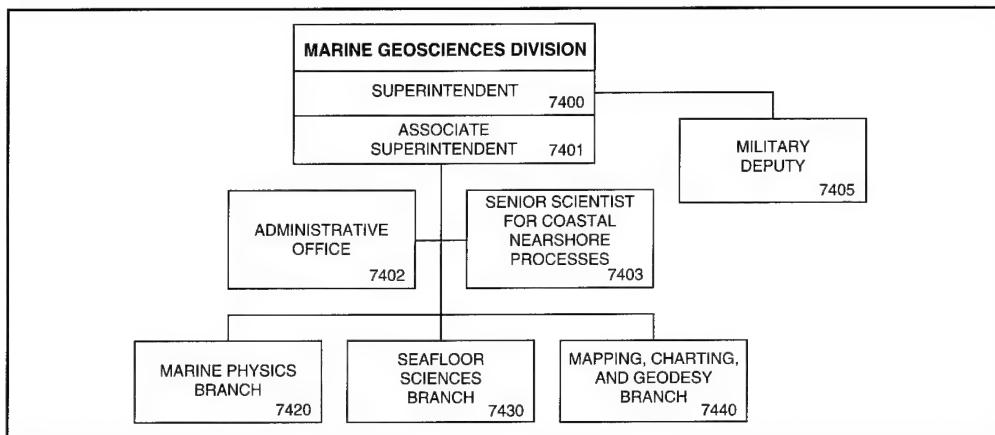
High-resolution subseafloor 2-D and 3-D seismic imaging  
Laser/hyperspectral bathymetry/topography  
Swath acoustic backscatter imaging  
Sediment pore water pressure, permeability, and undrained shear strength  
Compressional and shear wave velocity and attenuation  
Airborne geophysics, gravity, and magnetics  
Seafloor magnetic fluctuation  
Sediment microfabric change with pore fluid and/or gas change  
Instrumented mine shapes  
Bottom currents and pressure fluctuations



An instrumented mine has been developed by NRL to study burial at impact and subsequent burial by bedform migration, scour, and liquefaction. This instrument mine provides a tool for continuous monitoring of the movement of the mine (heading, pitch, and roll) as well as the percentage of the surface area of the mine actually buried. Experiments have been conducted off Panama City, Florida, at the Scripps Pier (La Jolla, California), in tidal pass at Destin, Florida, and in a high-energy nearshore region at the Army Corps of Engineers facility at Duck, North Carolina. Burial and/or scour induced by tidal currents, surface gravity waves, biological processes, and migrating sand waves have been documented.



DR. H.C. EPPERT, JR.



## Basic Responsibilities

The Marine Geosciences Division has responsibility for planning and executing a broad spectrum research, development, and technology program in marine geology, geophysics, geoacoustics, geotechniques, and geospatial information and systems (GIS). The program is designed to provide necessary digital databases, geoacoustic and geophysical models, and simulations to support training, system design, performance prediction, and operational needs of the Navy.

The applied portion of the program is directed toward (1) quantitatively predicting the effects of the seafloor and associated geophysical, geomorphological, and geoacoustic variability on performance of present and emerging naval systems, operations, and plans, and (2) developing technology and techniques to rapidly acquire, process, and analyze MC&G (gravity, magnetics, and bathymetry) and other types of geological, geophysical, and geoacoustic information to meet existing digital database requirements of the Chief of Naval Operations (CNO), National Image and Mapping Agency (NIMA), and system commands.

The Division serves as the focal point in the Navy and Marine Corps for assessing and identifying MC&G requirements, including prototype digital MC&G products and product coordination. The program is keyed to and responsive to priorities identified by NRL, Office of Naval Research, CNO, the System Commands, and NIMA. Close coordination and interaction with the Warfare Centers is essential to the success of this program with transition of Division products to system developers and the operational Navy a primary goal. The Division program is coordinated and interactive with other NRL programs and activities, ONR's Research Program Department, NOAA, USGS, NSF, and other government agencies involved in seafloor activities. The Division collaborates and cooperates with scientists from the academic community, other U.S. and foreign laboratories, and industry.

**Personnel:** 74 full-time civilian; 1 full-time military

## Key Personnel

Name	Title	Code
Dr. H.C. Eppert, Jr.	Superintendent	7400
Dr. P.J. Valent	Associate Superintendent	7401
Ms. C.L. Gilroy	Administrative Officer	7402
Dr. C.L. Vincent	Senior Scientist for Coastal and Nearshore Processes	7403
LCDR C.H. King, USN	Military Deputy	7405
Mr. H.S. Fleming	Head, Marine Physics Branch	7420
Dr. M.D. Richardson*	Head, Seafloor Sciences Branch	7430
Mr. M.M. Harris	Head, Mapping, Charting, and Geodesy Branch	7440

**Point of contact:** Ms. Margaret Gill, Code 7400, (228) 688-4650; DSN 828-4650

\*Acting

# Marine Meteorology Division

## Code 7500 Research Activity Areas

### Numerical Weather Prediction

Global  
Mesoscale  
On-scene  
Large eddy simulation  
Boundary layer  
Coastal  
Massively parallel computing  
Coupled ocean/atmosphere/wave  
Tropical cyclones  
Aerosols  
Topographically forced flow  
Predictability

### Data Assimilation

Optimum interpolation  
Variational analysis  
Quality control  
Synthetic soundings  
Remotely sensed data  
Physical initialization  
Direct radiance assimilation  
Radar data assimilation

### Shipboard Support

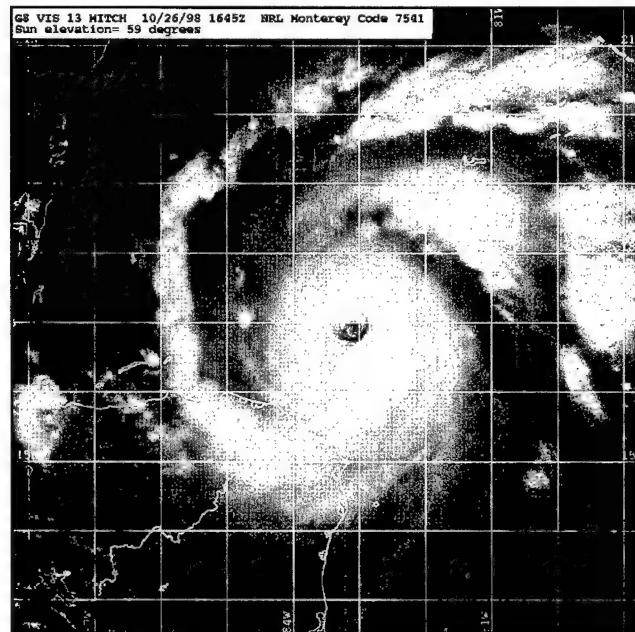
Naval Integrated Tactical Environmental Subsystem  
Data fusion  
Nowcasting  
Visualization  
Port studies  
Typhoon havens  
Forecaster handbooks  
Expert systems  
CD-ROMs

### Satellite Data/Imagery

Automated cloud classification  
Satellite imagery analysis  
Case study development  
Multisensor data fusion  
Tropical cyclone intensity  
Water vapor-tracked winds  
Cloud-tracked winds

### Decision Aids

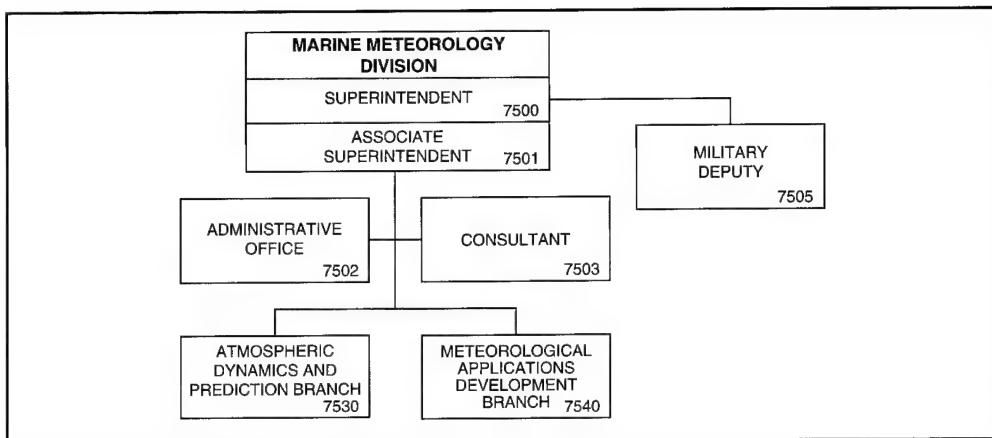
Refractivity  
Strike warfare  
Ceiling/visibility  
Fog/turbulence/icing  
Electromagnetic  
Electro-optical



Visible image for Hurricane Mitch on October 26, 1998 at 1645Z



DR. P.E. MERILEES



## Basic Responsibilities

The Marine Meteorology Division conducts a basic and applied research and development program designed to improve the basic understanding of atmospheric processes that impact Fleet operations and to develop information systems that analyze, simulate, predict, and interpret the structure and behavior of these processes and their effect on naval weapons systems. Basic research includes work in air-sea interaction, orographic and fetch-limited flow, atmospheric predictability, targeted observations, advanced data assimilation, and atmospheric physics. Applied research spans the gamut from development of both central-site and on-scene analysis/forecast systems to the development of tactical decision aids for operations support. NRL-Monterey (NRL-MRY) is co-located with the Fleet Numerical Meteorology and Oceanography Center (FNMOC) and has developed and transitioned to FNMOC the data assimilation global and mesoscale forecast models and satellite applications products that form the backbone of the Navy's worldwide weather forecasting capability. In addition, NRL is forging new ground by transitioning similar products and capabilities to the Navy's regionalized meteorology and oceanography centers around the globe. Specialties of the Division include numerical weather prediction, data assimilation and quality control, marine boundary layer processes, on-scene atmospheric environment assessment, environmental decision aids, database management, and satellite data interpretation and application.

**Personnel:** 64 full-time civilian; 2 full-time military

## Key Personnel

Name	Title	Code
Dr. P.E. Merilees	Superintendent	7500
Ms. P. Phoebus	Associate Superintendent	7501
Ms. C. Marks	Administrative Officer	7502
Dr. J. McCarthy	Consultant	7503
CDR K.F. Bedell, USN	Military Deputy	7505
Dr. R.M. Hodur	Head, Atmospheric Dynamics and Prediction Branch	7530
Dr. T.L. Tsui	Head, Meteorological Applications Development Branch	7540

**Point of contact:** Dr. P.E. Merilees, Code 7500, (408) 656-4721; DSN 878-4721

# Space Science Division

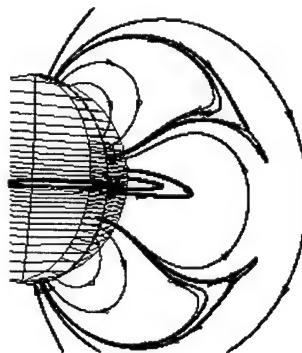
## Code 7600 Research Activity Areas

### Space Weather and Atmospheric Physics

Remote sensing of the ionosphere and thermosphere  
Middle atmospheric investigations  
Global modeling  
Upper atmospheric physics

### Space astronomy

X-ray observation, analysis, and theory of space astronomical sources  
Gamma-ray astrophysics, solar-flare gamma rays, and space cosmic ray particle environment  
Gamma-ray Large Area Space Telescope (GLAST)  
NASA space mission



The Solar Theory Group has simulated the overall magnetic field in the Sun's corona and demonstrated the formation of coronal mass ejections following field reconnection



A coronal mass ejection emerging from the Sun as a large, spherical region of hot gas and entrapped magnetic field

### Solar Physics

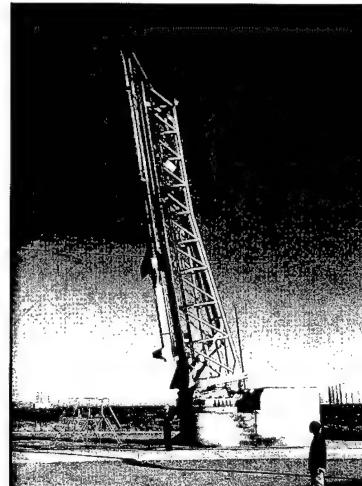
Solar ultraviolet and visible light spectroscopy and photometry from rockets, satellites, and the Space Shuttle  
Extreme ultraviolet Imaging Spectrometer (EIS)  
Sun Earth Connection Coronal and Heliospheric Investigation (SECCHI) for the Stereo Mission

### Solar-Terrestrial Relationships

Solar X-ray/EUV plasma diagnostics; coronal effects on Earth



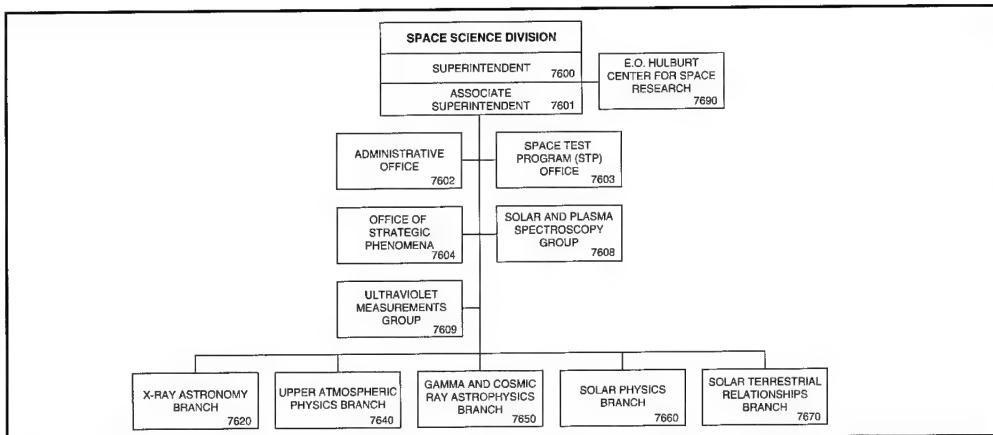
SHIMMER being readied for flight on the Space Shuttle. SHIMMER, a Michelson Interferometer, will map the globe in atmospheric trace compounds.



A Black Brand rocket being readied for flight at the White Sands Missile Range. The rocket is carrying NRL's advanced spectrometer for studying stars at soft x-ray wavelengths.



DR. H. GURSKY



## Basic Responsibilities

The Space Science Division conducts research in the fields of astronomy and astrophysics, solar-terrestrial physics, and atmospheric science. Satellites, rockets, and ground-based facilities are used to obtain information on radiation from the Sun and celestial sources, and to study the behavior of the ionosphere and high atmosphere. Research results are of importance to radio communications, to use of the space environment, to weather prediction, and to the fundamental understanding of natural radiation and geophysical phenomena. The Superintendent also acts as Chief Scientist of the E.O. Hulbert Center for Space Research, created to provide research opportunities in space science to appointees from universities.

**Personnel:** 79 full-time civilian

## Key Personnel

Name	Title	Code
Dr. H. Gursky	Superintendent	7600
Dr. F.J. Giovane	Associate Superintendent	7601
Mrs. B.M. Shea	Administrative Officer	7602
LT D.A. Bailey, USN	Space Test Program Officer, Kirtland AFB, NM	7603
Vacant	Head, Office of Strategic Phenomena	7604
Dr. U. Feldman	Head, Solar and Plasma Spectroscopy Group	7608
Dr. G. Carruthers	Head, Ultraviolet Measurements Group	7609
Mr. G.G. Fritz	Head, X-Ray Astronomy Branch	7620
Dr. R.R. Meier	Head, Upper Atmospheric Physics Branch	7640
Dr. J.D. Kurfess	Head, Gamma and Cosmic Ray Astrophysics Branch	7650
Dr. R.A. Howard	Head, Solar Physics Branch	7660
Dr. G.A. Doschek	Head, Solar Terrestrial Relationships Branch	7670
Dr. H. Gursky <sup>†</sup>	Chief Scientist, E.O. Hulbert Center for Space Research	7690

**Point of contact:** Mrs. B.M. Shea, Code 7602, (202) 767-3631

<sup>†</sup>Additional duty

# Naval Center for Space Technology

## NAVAL CENTER FOR SPACE TECHNOLOGY

### Code 8000

In its role to preserve and enhance a strong space technology base and provide expert assistance in the development and acquisition of space systems that support naval missions, the Naval Center for Space Technology activities extend from basic and applied research through advanced development in all areas of interest to the Navy space program. These activities include developing spacecraft, systems using these spacecraft, and ground command and control stations. Principal functions of the Center include understanding and clarifying requirements, recognizing and prosecuting promising research and development, analyzing and testing systems to quantify their capabilities, developing operational concepts

that exploit new technical capabilities, system engineering to allocate design requirements to subsystems, and engineering development and initial operation to test and evaluate selected spacecraft subsystems and systems. The Center is a focal point and integrator for those divisions at NRL whose technologies are used in space systems. The Center also provides systems engineering and technical direction assistance to system acquisition managers of major space systems. In this role, technology transfer is a major goal and motivates a continuous search for new technologies and capabilities and the development of prototypes that demonstrate the integration of such technologies.

## Director of Naval Center for Space Technology



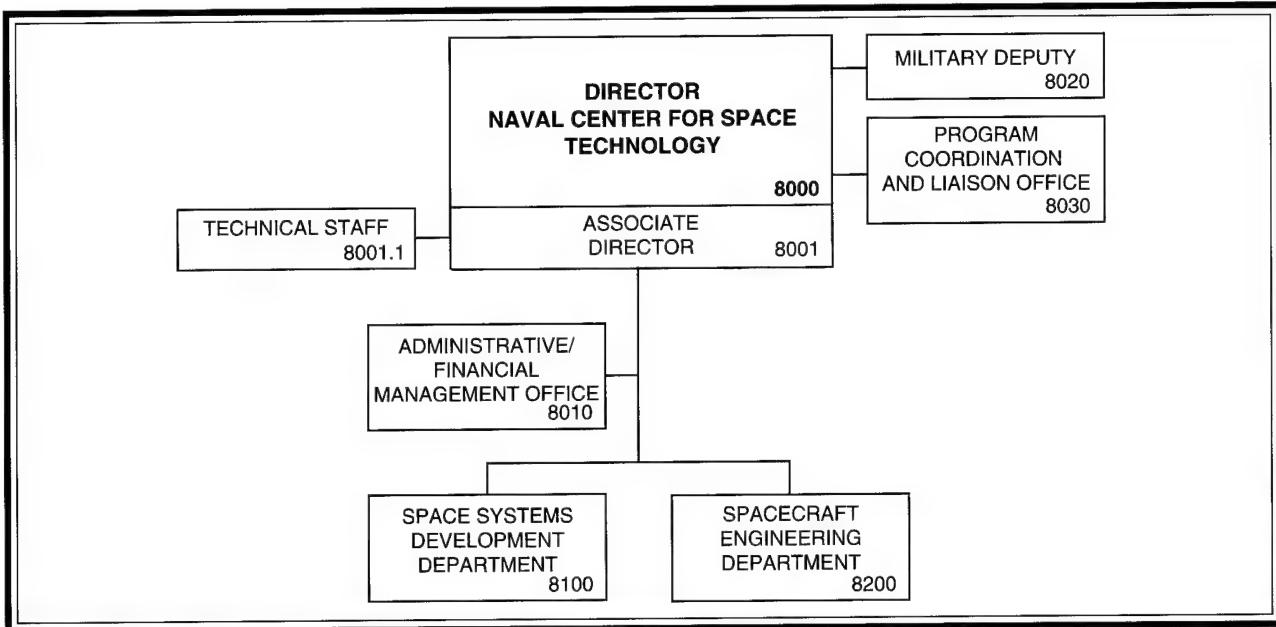
**M**r. P.G. Wilhelm was born in New York City on July 26, 1935. He attended Purdue University, where he received a B.S.E.E. degree in 1957. By 1961, he had completed all the course work for an M.S.E. degree from George Washington University.

From 1957 to 1959, Mr. Wilhelm served as an electrical engineer with Stewart Warner Electronics where he was assigned to a project to redesign the UPM-70, a Navy radar test set. In March 1959, he joined the Naval Research Laboratory as an electrical scientist in the Electronics Division. In December 1959, he joined the Satellite Techniques Branch. In 1961, he

became Head of the Satellite Instrument Section; in 1965, he

became Head of the Satellite Techniques Branch; and in 1974, Head of the Spacecraft Technology Center. In these positions, he performed satellite system design, equipment development, environmental testing, launch operations, and orbital data handling. In 1981, he was named the Superintendent of the Space Systems and Technology Division, the Navy's principal organization, or lead Laboratory, for space. He is credited with contributions in the design, development, and operation of 85 scientific and Fleet-support satellites. He has been awarded five patents. In October 1986, he was appointed Director of the newly established Naval Center for Space Technology. The Center's mission is to "preserve and enhance a strong space technology base and provide expert assistance in the development and acquisition of space systems which support naval missions."

Mr. Wilhelm has been recognized with numerous awards including the Navy's Meritorious Civilian Service Award, the DoD Distinguished Civilian Service Award, the Presidential Meritorious Executive Award, the Presidential Distinguished Rank Award, the Institute of Electrical and Electronics Engineers Aerospace and Electronic Systems Group Man of the Year Award, the NRL E.O. Hulbert Annual Science and Engineering Award, the Dexter Conrad Award, the Rotary National Stellar Award, and in May 1999 Mr. Wilhelm received the American Institute of Aeronautics and Astronautics (AIAA) Goddard Astronautics Award. He also has been elected a Fellow of the Washington Academy of Sciences and a Fellow of the American Institute of Aeronautics and Astronautics, and was elected to the National Academy of Engineering. Mr. Wilhelm is also the first recipient of the R.L. Easton Award, for excellence in engineering.



## Key Personnel

Name	Title	Code
Mr. P.G. Wilhelm	Director, Naval Center for Space Technology	8000
Mr. F.V. Hellrich	Associate Director	8001
	Technical Staff	8001.1
Mrs. B.L. Fleming	Head, Administrative/Financial Management Office	8010
LCDR J. Legaspi	Military Deputy	8020
Mr. P. Regeon	Head, Program Coordination and Liaison Office	8030
Mr. R.E. Eisenhauer	Superintendent, Space Systems Development Department	8100
Mr. H.E. Senasack, Jr.	Superintendent, Spacecraft Engineering Department	8200

**Point of contact:** Mr. F.V. Hellrich, Code 8001, (202) 767-6549

# Space Systems Development Department

## Code 8100 Research Activity Areas

### Advanced Space Systems Technologies

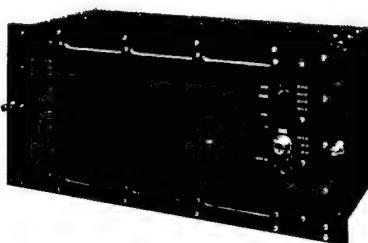
Space systems architectures and requirements  
Advanced payloads and optical communications  
Controllers, processors, signal processing, and VLSI  
Data management systems and equipment  
Embedded algorithms and software  
Satellite laser ranging

### Astrodynamics

Precision orbit estimation  
Onboard autonomous navigation  
Star catalog development  
Onboard orbit propagation  
GPS space navigation  
Satellite coverage and mission analysis  
Geolocation systems  
Orbit dynamics  
Interplanetary navigation

### Command, Control, Communications, Computers, and Intelligence

Communications theory and systems  
Tracking, telemetry, and control systems  
Satellite ground station engineering and implementation  
Transportable and fixed ground antenna systems  
High-speed fixed and mobile ground data collection, processing, and dissemination systems  
Tactical communication systems



The Joint Combat Information Terminal (JCIT) uses advanced RF and digital technology to provide unprecedented battlefield connectivity and combat information processing in a compact, modular, on-the-fly reconfigurable unit with an open system architecture. The JCIT contains up to eight multiband transceivers, embedded INFOSEC, message processing, date storage, crypto key management, GPS, and power supplies in a 19" rack mount or three-fourths ATR chassis weighing less than 50 lbs. It can simultaneously transmit, receive, encrypt, decrypt, and process voice and video. The system is software reprogrammable to support a variety of mission scenarios to achieve functionality and diversity. The design of the JCIT permits interoperability with legacy systems, interservice, international, and coalition partner systems. Designed for airborne platforms, the JCIT is fully qualified for land, sea, and subsea applications.

### Space Electronic Systems Development

Space system concept definition, design, and implementation including hardware and software  
Detailed electrical/electronic design of electronic and electromechanical systems and components  
Implementation of real-time flight software and embedded command, control and telemetry software  
Design and verification of real-time embedded multiprocessor software  
Spacecraft antenna systems  
Space systems fabrication, test, and integration  
Launch and on-orbit support  
Space test systems and electronic launch support equipment

### Space Electronic Warfare

Design criteria for counter-surveillance and counter-targeting  
Data search, analysis, and synthesis of information related to special sensor performance

### Space Mission Development

Mission development and requirements definition  
Systems engineering and analysis  
Concepts of operations and mission simulations  
Mission evaluation and performance assessments

### Space Surveillance, Navigation, and Time

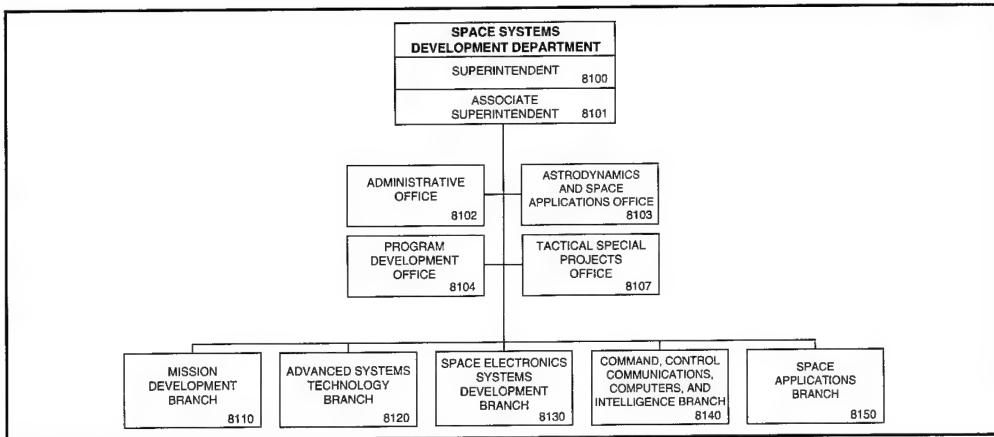
Advanced navigation satellite technology  
Precise Time and Time Interval (PTTI) technology  
Atomic-time/frequency standards/instrumentation  
Passive and active ranging techniques  
Detection and precision tracking of orbiting objects from space and ground



The "ICEBOX" is a transportable satellite communications and relay station that has been deployed around the world in support of Naval operations. ICEBOX is transportable via a C141 Aircraft and can provide satellite communications and in-theater monitoring capabilities for a number of situations. ICEBOX has a number of innovative features that include remote operations and troubleshooting, automatic transmit and receive, multifunctional antennas, and innovative processing techniques.



MR. R.E. EISENHAUER



## Basic Responsibilities

The Space Systems Development Department (SSDD) is the space and ground support systems research and development organization of the Naval Center for Space Technology. The primary objective of the SSDD is to develop space systems to respond to Navy, DoD, and national mission requirements with improved performance, capacity, reliability, efficiency, and/or life cycle cost. The Department must derive system requirements from the mission, develop architectures in response to these requirements, and design and develop systems, subsystems, equipment, and implementation technologies to achieve the optimized, integrated operational space and ground system. These development responsibilities extend across the entire space/ground spectrum of hardware, software, and advanced technologies, including digital processing and control, analog systems, power, communications, command and telemetry, radio frequency, optical, payload, and electromechanical systems, as well as systems engineering.

**Personnel:** 233 full-time civilian

## Key Personnel

Name	Title	Code
Mr. R.E. Eisenhauer	Superintendent	8100
Mr. W.R. Webster*	Associate Superintendent	8101
Ms. M.R. Hudson	Administrative Officer	8102
Mr. J. Middour	Head, Astrodynamics and Space Applications Office	8103
Mr. B.J. Lamb	Head, Program Development Office	8104
Mr. M.T. Powell	Head, Tactical Special Projects Office	8107
Mr. D.L. Pettit*	Head, Mission Development Branch	8110
Mr. W.R. Webster	Head, Advanced Systems Technology Branch	8120
Mr. G.E. Flach	Head, Space Electronics Systems Development Branch	8130
Mr. R.E. Eisenhauer*	Head, Command, Control, Communications, Computers, and Intelligence Branch	8140
Mr. R.L. Beard	Head, Space Applications Branch	8150

**Point of contact:** Ms. M.R. Hudson, Code 8102, (202) 767-0432

\*Acting

# Spacecraft Engineering Department

## Code 8200 Research Activity Areas

### Design, Test, and Processing

Design, fabrication, and testing of spacecraft and hardware:

Preliminary and detailed design

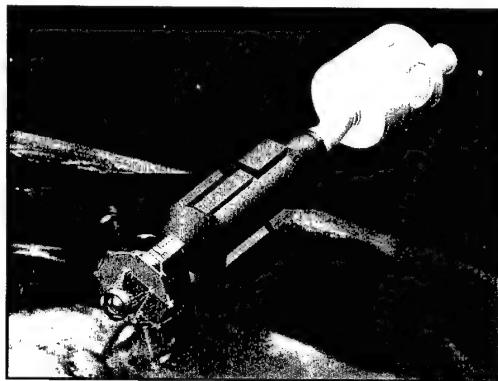
Fabrication

Testing

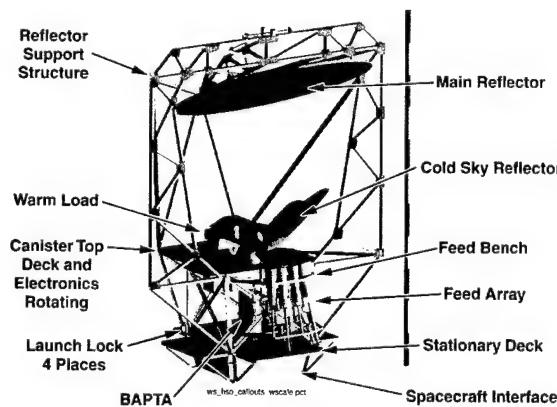
Integration onto launch vehicle

Systems engineering for new spacecraft proposals

Start-to-finish responsibility for NCST spacecraft mechanical systems



NRL's Interim Control Module (ICM) will provide attitude control and reboost capability for the International Space Station.



WindSat demonstrates the use of Passive Microwave Polarimetry from space to measure the full ocean surface wind field (wind speed and direction).

### Systems Analysis

Research and development in spacecraft technology

Conceptual design trade studies

Integrated engineering design and analysis

Structural and thermal analysis

Development and transition of prototype hardware

Development and integration of experimental

payloads

### Control Systems

Attitude determination and control systems

Reaction control

Precision pointing

Propulsion systems

Analytical design and mission planning

Navigation, tracking, and orbit dynamics

Expert systems

Flight operations support

Computer simulation

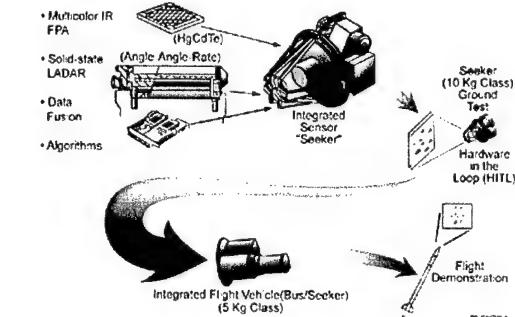
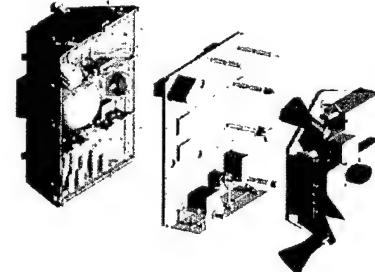
Computer animation

Robotics engineer-

ing and control

Spaceborne robotics applications

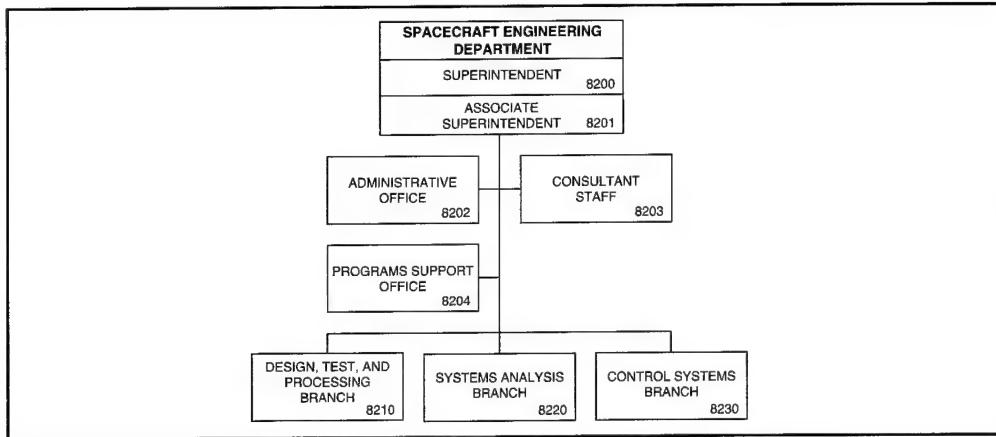
Naval EarthMap  
Observer (NEMO)  
will provide  
Hyperspectral  
technology applica-  
tions for coastal  
ocean and littoral  
imaging, resource  
monitoring, and  
mineral mapping.



Discriminating Interceptor Technology (DITP) demonstrates technologies traceable to NMD and TMD applications to include miniaturized IR and LADAR sensors and sensor fusion processing hardware.



MR. H.E. SENASACK, JR.



## Basic Responsibilities

The Spacecraft Engineering Department (SED) is the focal point for the Navy's capability to design and build spacecraft. Activities range from concept and feasibility planning to on-orbit IOC for the NRL's space systems.

The SED provides spacecraft bus expertise for the Navy and maintains an active in-house capability to develop satellites; manages Navy space programs through engineering support and technical direction; in concert with the Space Systems Development Department, designs, assembles and tests spacecraft and space experiments, including all aspects of space, launch, and ground support; analyzes and designs structures, mechanisms, and a variety of control systems, including attitude, propulsion, reaction, and thermal; integrates satellite designs, launch vehicles, and satellite-to-boost stages; functions as a prototype laboratory to ensure that designs can be transferred to industry and incorporated into subsequent satellite hardware builds; and consults with the Navy Program Office on technical issues involving spacecraft architecture, acquisition, and operation.

**Personnel:** 93 full-time civilian

## Key Personnel

Name	Title	Code
Mr. H.E. Senasack, Jr.	Superintendent	8200
Mr. J.P. Schaub	Associate Superintendent	8201
Ms. C. Gross	Administrative Officer	8202
Mr. A. Hull	Consultant Staff	8203
Vacant	Head, Programs Support Office	8204
Mr. J.A. Hauser II	Head, Design, Test, and Processing Branch	8210
Mr. M.A. Brown	Head, Systems Analysis Branch	8220
Mr. H.E. Senasack, Jr.*	Head, Control Systems Branch	8230

**Point of contact:** Mr. H.E. Senasack, Jr., Code 8200, 767-6411

\*Acting

## **Technical Output, Fiscal, and Personnel Information**

## Technical Output

### Publications, Presentations, and Patents

The Navy continues to be a pioneer in initiating new developments and a leader in applying these advancements to military requirements. The primary means of informing the scientific and engineering community of the advances made at NRL is through the Laboratory's technical output—reports, articles in scientific journals, contributions to books, papers presented to scientific societies, and topical conferences, patents, and inventions.

The figures for calendar years 1999 and 2000 presented below represent the output of NRL facilities in Washington, DC; Bay St. Louis, Mississippi; and Monterey, California.

In addition to the output listed, NRL scientists made more than 1,822 oral presentations during 1999 and 1,257 oral presentations during 2000.

In 1986, Congress enacted the Federal Technology Transfer Act in an effort to encourage the commercial use of technology developed in Federal laboratories. The Act allows Government inventors and the laboratories where they work to share the royalties generated by commercial licensing of their inventions. Also, the Act encourages the establishment of cooperative research and development agreements between laboratories such as NRL and nonfederal entities such as state and local governments, universities, and business corporations. Such cooperative R&D agreements can include the allocation in advance of patent rights on any inventions made under the joint research effort.

The 1986 Act has given additional impetus to the Laboratory's efforts to patent important inventions arising out of its various research programs.

#### Calendar Year 1999

Type of Contribution	Unclassified	Classified	Total
Articles in periodicals, chapters in books, and papers in published proceedings	1,117	0	1,117*
NRL Formal Reports	18	12	30
NRL Memorandum Reports	87	10	97
Books	2	0	2
Patents granted			88
Statutory Invention Registrations (SIRs)			4

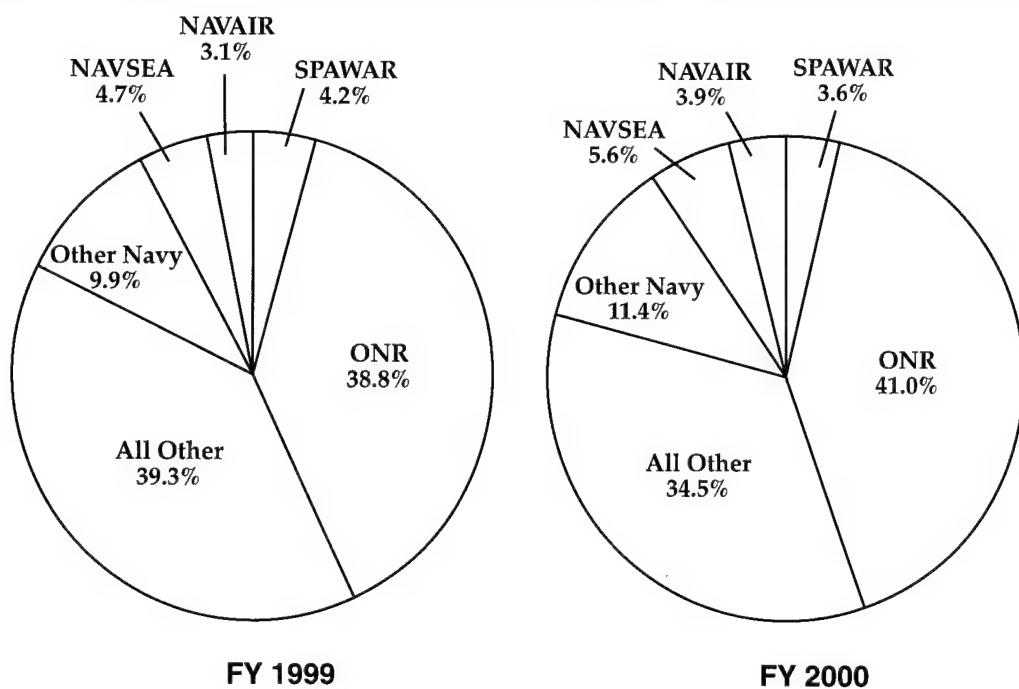
#### Calendar Year 2000

Type of Contribution	Unclassified	Classified	Total
Articles in periodicals, chapters in books, and papers in published proceedings	1,014	9	1,023
NRL Formal Reports	20	10	30
NRL Memorandum Reports	94	7	101
Books	0	0	0
Patents granted			80
Statutory Invention Registrations (SIRs)			3

\*This is a provisional total based on information available to the Ruth H. Hooker Research Library and Technical Information Center on January 6, 2000. Additional publications carrying a 1999 publication date are anticipated.

\*\*This is a provisional total based on information available to the Ruth H. Hooker Research Library and Technical Information Center on January 25, 2001. Additional publications carrying a 2000 publication date are anticipated.

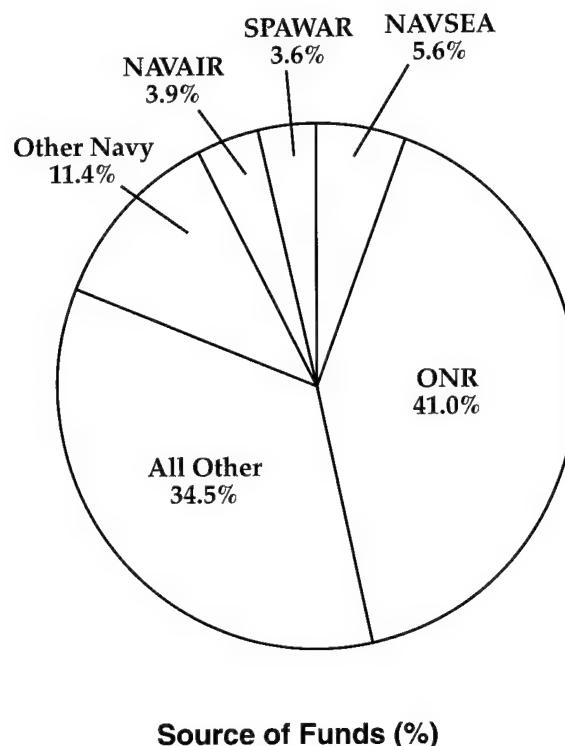
## FY 1999/2000 Sources of New Funds (Actual)



### Source of Funds (%)

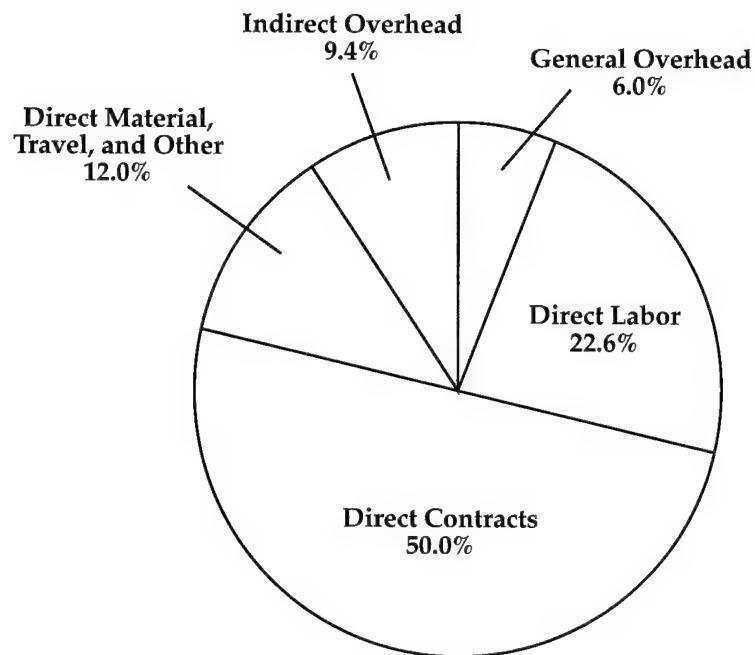
	\$M		
	Reimbursable	Direct Cite	Total
<b>FY 1999</b>			
Office of Naval Research (ONR)	239.1	54.9	294.05
Naval Sea Systems Command (NAVSEA)	22.3	13.2	35.5
Space and Naval Warfare Systems Command (SPAWAR)	23.9	8.2	32.1
Naval Air Systems Command (NAVAIR)	18.9	4.5	24.4
Other Navy	52.1	23.3	75.4
All Other	197.0	101.0	298.0
Total Funds	553.3	205.1	758.4
<b>FY 2000</b>			
Office of Naval Research (ONR)	248.8	63.8	312.6
Naval Sea Systems Command (NAVSEA)	25.2	17.8	43.0
Space and Naval Warfare Systems Command (SPAWAR)	17.4	10.2	27.6
Naval Air Systems Command (NAVAIR)	9.7	19.9	29.6
Other Navy	49.0	37.9	86.9
All Other	179.6	83.0	262.6
Total Funds	529.7	232.6	762.3

## FY 2001 Sources of New Funds (Plan)



FY 2001	\$M		
	Reimbursable	Direct Cite	Total
Office of Naval Research (ONR)	247.8	63.1	310.9
Naval Sea Systems Command (NAVSEA)	25.1	17.6	42.7
Space and Naval Warfare Systems Command (SPAWAR)	17.4	10.0	27.4
Naval Air Systems Command (NAVAIR)	9.7	19.7	29.4
Other Navy	48.8	37.5	86.3
All Other	<u>178.8</u>	<u>82.1</u>	<u>260.9</u>
Total Funds	527.6	230.0	757.6

## FY 2001 Distribution of New Funds (Plan)

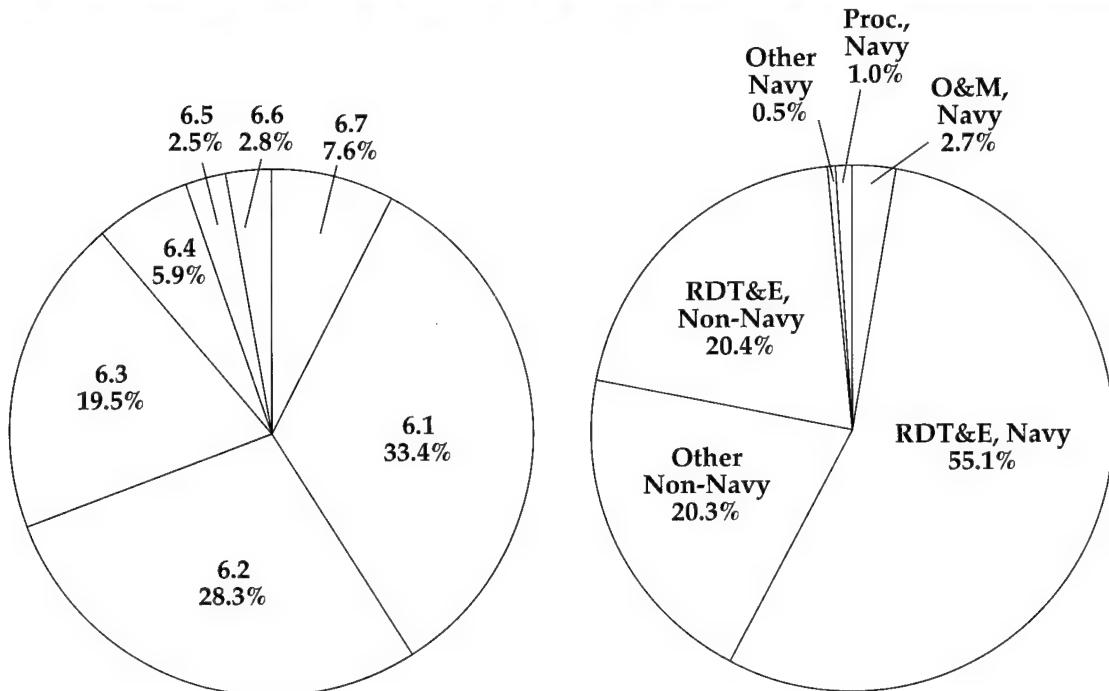


**Distribution of Funds (%)**

	\$M
Direct Labor	171.0
General Overhead	44.9
Indirect Overhead	71.0
Direct Material, Travel, and Other	92.1
Direct Contracts*	378.6
Total Funds	757.6

\*Direct contracts include reimbursable and direct citation funding.

## FY 2001 Reimbursable New Funds by Category (Plan)



**Distribution of RDT&E, Navy (%)  
(\$290.7)**

**Distribution of Reimbursable (%)  
(\$527.6)**

Category	Navy	Non-Navy	Total
6.1 Basic Research	97.1	1.3	98.4
6.2 Applied Research	82.4	19.1	101.5
6.3 Advanced Technology Development	56.6	66.4	123.0
6.4 Demonstration and Validation	17.2	7.0	24.2
6.5 Engineering and Manufacturing Development	7.2	2.6	9.8
6.6 RDT&E Management Support	8.2	0.5	8.7
6.7 Operational System Development	<u>22.0</u>	<u>10.7</u>	<u>32.7</u>
<b>Subtotal RDT&amp;E</b>	<b>290.7</b>	<b>107.6</b>	<b>398.3</b>
Operations and Maintenance	14.3	3.9	18.2
Procurement	5.3	22.7	28.0
Other	<u>2.7</u>	<u>80.4</u>	<u>83.1</u>
<b>Total Reimbursable Funds</b>	<b>313.0</b>	<b>214.6</b>	<b>527.6</b>

## Personnel Information\*

### **Civilian**

#### Full-Time, Permanent (FTP)

Graded	2,392
Ungraded	<u>116</u>
Total	2,508

#### Temporary, Part-Time, Intermittent (TPTI)

TPTI	<u>62</u>
------	-----------

Total Civilian	2,570
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#### Graded FTP Breakdown

Scientists, Engineers, and SES	1,480
Administrative—Professional	60
Administrative—Management	309
Technicians	261
Other-Clerical	178
Other-General	<u>104</u>
Total	2,392

Civilian Budgeted End-Strength	2,950
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### **Military**

Officers	33
Enlisted	<u>87</u>

Total Military On-Board	120
Military Allowance	127

On-Board	Total Military	Total Civilian	FTP	TPTI	FTP Ungraded	FTP Graded
2,690	120	2,570	2,508	62	116	2,392

### **Annual Civilian Turnover Rate (%) (permanent employees only)**

	1996	1997	1998	1999	2000
Research divisions	7.3	8.7	9.1	11.62	10.02
Nonresearch areas	9.8	8.6	12.3	18.14	10.85
Entire Laboratory	7.9	8.7	9.8	12.89	10.18

### **Highest Academic Degrees Held by Permanent Employees**

Bachelors	528
Masters	353
Doctorates	822

\*Military numbers are current as of 30 April 2001; figures include all NRL sites.

Numbers are current as of 17 May 2001; figures include all NRL sites.

Civilian Budgeted End-Strength number is for FY 2001.

## **Professional Development**

## Professional Development

NRL has established programs for the professional and personal development of its employees so they may better serve the needs of the Navy. These programs develop and retain talented people and keep them abreast of advanced technology and management skills. Graduate assistantships, fellowships, sabbatical study programs, cooperative education programs, individual college courses, and short courses for personal improvement contribute to professional development.

Programs also exist for non-NRL employees. These programs enhance research efforts by providing means for non-NRL professionals to work at the Laboratory, thereby improving the interchange of ideas, meeting critical short-term technical requirements, and providing sources for new scientists and engineers. The programs include two-year graduate fellowships, faculty and professional interchanges, undergraduate work, and introducing gifted and talented high school students to the world of technology.

### Programs for NRL Employees

During 1998, under the auspices of the Employee Development Branch, NRL employees participated in about 4,000 individual training events. Many of these were presented in-house courses on diverse technical subjects, computer software, management techniques, and enhancement of such personal skills as efficient use of time, project management, memory improvement, and interpersonal communications.

One common study procedure is for employees to work full time at the Laboratory while taking job-related scientific courses at universities and schools in the Washington area. The training ranges from a single course to full graduate-level programs. Tuition for training is paid by NRL. The formal programs offered by NRL are described below.

#### Graduate Programs

- The **Advanced Graduate Research Program** (formerly the Sabbatical Study Program, which began in 1964) enables selected professional employees to devote full time to research or pursue work in their own or a related field for one year at an institution or research facility of their choice without the loss of regular salary, leave, or fringe benefits. NRL pays all educational costs, travel, and moving expenses for the employee and dependents. Criteria for eligibility include professional stature consistent with the applicant's opportunities and experience, a satisfactory program of study, and acceptance by the facility selected by the applicant. The program is open to paraprofessional (and above) employees who have completed six years of Federal service, four years of which are required at NRL.

- The **Edison Memorial Graduate Training Program** enables employees to pursue advanced studies in their fields at local universities. Participants in this program work 24 hours each work-week and pursue their studies during the other 16

hours. The criteria for eligibility include a minimum of one year of service at NRL, a bachelor's or master's degree in an appropriate field, and professional standing in keeping with the candidate's opportunities and experience.

- To be eligible for the **Select Graduate Training Program**, employees must have a college degree in an appropriate field and must have demonstrated ability and aptitude for advanced training. Students accepted in this program devote a full academic year to graduate study. While attending school, they receive one half of their salary; and NRL pays for tuition, books, and laboratory expenses.

- The **Naval Postgraduate School (NPS)**, located in Monterey, California, provides graduate programs to enhance the technical preparation of Naval officers and civilian employees who serve the Navy in the fields of science, engineering, operations analysis, and management. It awards a master of arts degree in national security affairs and a master of science degree in many technical disciplines.

NRL employees desiring to pursue graduate studies at NPS may apply for a maximum of six quarters away from NRL, with thesis work accomplished at NRL. Specific programs are described in the NPS catalog. Participants will continue to receive full pay and benefits during the period of study.

- Research conducted at NRL may be used as thesis material for an advanced degree.

This original research is supervised by a qualified employee of NRL who is approved by the graduate school. The candidate should have completed the required course work and should have satisfied the language, residence, and other requirements of the graduate school from which the degree is sought. NRL provides space, research facilities, and supervision but leaves decisions on academic policy to the cooperating schools.

## Professional Development

NRL has programs, professional society chapters, and informal clubs that enhance the professional growth of employees. Some of these are listed below.

- The **Congressional Fellowship Program**, sponsored by the American Political Science Association, provides an opportunity for some of the most promising young, technically oriented Federal executives to participate in a variety of assignments designed to develop their knowledge and understanding of Congressional operations. These Fellows share activities with other members of the Congressional Fellowship Program who come mainly from journalism, law, and college teaching.

- The **LEGIS Fellows Program** provides assignments for personnel whose current or prospective positions may require working knowledge of the operations of the Congress. The Fellows receive instruction and hands-on experience in a Congressional office through training/developmental activities such as seminars, intensive briefings, and assignments on the staff of a member, committee, or support agency of the Congress in Washington, DC.

- The **Counseling Referral Service (C/RS)** helps employees to achieve optimal job performance through counseling and resolution of problems such as family, stress and anxiety, behavioral, emotional, and alcohol- or drug- related problems that may adversely impact job performance.

C/RS provides confidential assessments and short-term counseling, as well as training workshops and referrals to additional resources in the community. (Contact Dr. Ralph Surette at (202) 767-6857, NRL Washington, D.C.; (228) 688-5726,

NRL Stennis Space Center; 1-800-523-5668, NRL Monterey).

- The **NRL WISE Network**, a merger of the NRL Women's S&T Network and the NRL WISE Chapter, is open to all professional women in science and engineering. The goal of this organization is to provide an environment for personal and professional growth. The organization sponsors projects that will lead to such an environment such as the NRL Mentor Program. In addition, informal monthly luncheon meetings and seminars are held. Distinguished female scientists and engineers are invited to discuss with the group their professional experience.

Members of the **NRL WISE Network** meet at noon the first Friday of each month at the science lounge in building 222. These brown bag luncheon meetings are open to all NRL female scientists and engineers, including contractors and postdoctoral associates. If you would like to be on the electronic mailing list, please send your e-mail address to [Women@ccf.nrl.navy.mil](mailto:Women@ccf.nrl.navy.mil) in order to be notified with events and issues of interest. (For further information, contact the secretary of the **NRL WISE Network**, Dr. Joan E. Yater at (202) 404-4494).

- **Sigma Xi**, the Scientific Research Society, encourages and acknowledges original investigation in scientific research. As an honor society for research scientists, individuals who have demonstrated the ability to perform original research are elected to membership in local chapters. The NRL-Edison Chapter, comprised of several hundred members, recognizes leadership research at NRL by presenting awards annually in pure and applied science to outstanding NRL staff members. This year the chapter has initiated a Young Investigator Award to be presented to an outstanding young NRL researcher. The NRL-Edison Chapter also sponsors lectures at NRL on a wide range of scientific topics for the entire NRL community. These lectures are delivered by scientists from all over the nation and the world. The highlight of the Sigma Xi lecture series is the Edison Memorial Lecture, traditionally featuring a Nobel laureate. (Contact Dr. B.R. Ratna at (202) 404-6061.)

- The **NRL Mentor Program** was established to provide an innovative approach to professional and career training and an environment for personal and professional growth. It is open to all NRL employees in all job series and at all sites. Mentorees are matched with successful, experienced colleagues with more technical and/or managerial experience, who can provide them with the knowledge and skills needed to maximize their contribution to the success of their immediate organization, to NRL, to the Navy, and to their chosen career fields. The

ultimate goal of the program is to increase job productivity, creativity, and satisfaction through better communication, understanding, and training. NRL Instruction 12400.1 established the NRL Mentor Program, and it provides the policy and procedures for the program. (Contact Elaine Butler at (202) 767-6736.)

- The Charlotte Moore-Sitterly Chapter of **Federally Employed Women, Inc.** (FEW) was chartered at NRL in 1993. FEW is an international organization of federally employed women and men whose purpose is to eliminate sex discrimination and sexual harassment and enhance career opportunities for women in government. FEW works closely with other Federal agencies and organizations, including the Office of Personnel Management, Equal Employment Opportunity Commission, and Federal Women's Program subcommittees. (Contact Dr. Virginia Degiorgi at (202) 767-9027.)

- Employees interested in developing effective self-expression, listening, thinking, and leadership potential are invited to join either of two NRL chapters of **Toastmasters International**, the Thomas Edison Club or the Forum Club. Members of these clubs, who possess diverse career backgrounds and talents, learn to communicate not by rules but by practice in an atmosphere of understanding and helpful fellowship. NRL's Commanding Officer and the Director of Research endorse Toastmasters. (Thomas Edison Club: contact Jim Wardenfels at (202) 767-3003 or at his e-mail address, [wardenfels@contracts.nrl.navy.mil](mailto:wardenfels@contracts.nrl.navy.mil); Forum Club: contact Darryl Harris at (202) 404-1104 or at his e-mail address, [deharris@ccf.nrl.navy.mil](mailto:deharris@ccf.nrl.navy.mil).)

## Continuing Education

NRL employees take government sponsored college courses (undergraduate and graduate) in order to improve their skills and keep abreast of current developments in their fields.

- The Human Resources Office (HRO) at NRL offers to all employees **short courses** in certain program areas that are not available at local schools; Laboratory employees may attend these courses at nongovernment facilities as well. Interagency courses in management, personnel, finance, supervisory development, clerical skills, and other areas are also available.

## Other Programs

- The **Brookings Institution** offers a variety of seminars and conferences devoted to research, education, and publication on important issues of domestic and foreign policy.

- OPM's **Management Development Center** offers one- and two-week courses in intensive policy

and management training for government managers and executives.

- The **Excellence in Government Fellows Program** is an extensive, year-long leadership development opportunity to build the capacity of mid-level federal managers to lead organizations and produce results. As part of their fellowship year, participants develop strategies for meeting the complex challenges facing their organizations.

## Technology Base

- The **Scientist-to-Sea Program** (STSP) provides increased opportunities for Navy R&D laboratory/center personnel to go to sea for several days to gain first-hand insight into operational factors affecting system design, performance, and operations on a variety of ships.

For further information on the Technology Base Programs, contact Dr. Stephen Sacks, Code 5006, (202) 767-3666.

## Equal Employment Opportunity (EEO) Programs

Equal employment opportunity is a fundamental NRL policy for all persons, regardless of race, color, sex, religion, national origin, age, or physical/mental handicap. The EEO office's major functions include affirmative action in employment, discrimination complaint process, EEO training, advice and guidance to management on EEO policy, and the following special emphasis programs:

- The **Federal Women's Program** (FWP) supports and enhances employment and advancement opportunities for women and addresses issues that affect women in the workplace.

- The **Hispanic Employment Program** (HEP) focuses on working with supervisors, managers, and subcommittees to recruit and place qualified Hispanics. The program is involved with Hispanic community organizations and local schools and provides activities specifically designed to offer information on employment and advanced education opportunities to Hispanics.

- The **African-American Employment Program** (AAEP) concentrates on recruiting, developing, and advancing African-American employees throughout NRL. It also encourages employees to achieve their maximum potential. The AAEP sponsors awareness programs with distinguished persons as guest lecturers.

- The **Individuals with Disabilities Program** (IWD) assists management to improve employment and advancement opportunities for qualified disabled employees. It also advises on accommodations necessary for disabled persons. The IWD

recruits disabled students from colleges and universities for summer, co-op, and permanent positions in engineering and science.

- The **Asian-American/Pacific Islander Program** (API) identifies areas of concern regarding the recruitment, selection, advancement, retention, and utilization of API employees throughout NRL. The program interacts with API professional/community organizations to address employment concerns.

- The **Federal Employment Opportunity Recruitment Program** (FEORP) is designed to establish, maintain, and update targeted recruitment programs to reduce the conspicuous absence or manifest imbalance categories of NRL employment through innovative internal and external recruitment. In addition, it fosters relationships with minority and women's institutions and organizations.

Special programs are held during the year to promote an awareness of the contributions and capabilities of women and minorities. (Contact the EEO office at (202) 767-2486 for all EEO programs.)

## **Other Activities**

- The **Community Outreach Program** traditionally has used its extensive resources to foster programs that provide benefits to students and other community citizens. Volunteer employees assist with and judge science fairs, give lectures, tutor, mentor, coach, and serve as classroom resource teachers. The program also sponsors African-American History Month art and essay contests for local schools, student tours of NRL, a student Toastmasters Youth Leadership Program, an annual holiday party for neighborhood children, a surplus computer transfer program, and an

annual book drive to support school libraries. Through this program NRL has active partnerships with four District of Columbia, three Aberdeen, Maryland, and three Calvert County, Maryland, public schools. (Contact the Public Affairs Office at (202) 767-2541.)

- Other programs that enhance the development of NRL employees include four computer user groups (**IBM PC**, **Mac**, **NeXT**, and **Sun**). The **Amateur Radio Club** is devoted to amateur and related radio communications and is open to licensed radio operators as well as others interested in radio. The wide spectrum of club activities range from vintage radio to satellite communications. A club station is available for use by all members. The club conducts annual nationally coordinated Field Day (simulated emergency) operations. The **Recreation Club** accommodates the varied interests of NRL's employees with its numerous facilities, such as a 25-yard, 6-lane indoor swimming pool; basketball and volleyball courts; a weight room; an exercise room; table tennis; a meeting room; softball and basketball leagues; hot tubs; saunas; classes in five different types of martial arts, in aerobics exercise, in swimming, in water aerobics, and in water walking. The **Showboaters**, a nonprofit drama group that presents live theater for the enjoyment of NRL and the community, performs two major productions each year in addition to occasional performances at Laboratory functions and benefits for local charities. Though based at NRL, membership in Showboaters is not limited to NRL employees.



# Programs for Non-NRL Employees

Several programs have been established for non-NRL employees. These programs encourage and support the participation of visiting scientists and engineers in research of interest to the Laboratory. Some of the programs may serve as stepping-stones to federal careers in science and technology. Their objective is to enhance the quality of the Laboratory's research activities through working associations and interchanges with highly capable scientists and engineers and to provide opportunities for outside scientists and engineers to work in the Navy laboratory environment. Along with enhancing the Laboratory's research, these programs acquaint participants with Navy capabilities and concerns.

## Recent Ph.D., Faculty Member, and College Graduate Programs

- The National Research Council (NRC)/  
**NRL Cooperative Research Associateship Program** selects associates who conduct research at NRL in their chosen fields in collaboration with NRL scientists and engineers. The tenure period is two years.

- The American Society for Engineering Education (ASEE) Postdoctoral Fellowship Program aims to increase the involvement of highly trained scientists and engineers in disciplines necessary to meet the evolving needs of naval technology. Appointments are for one year (renewable for a second and sometimes a third year). These competitive appointments are made by ASEE.

- The Consortium for Oceanographic Research and Education (CORE) Postdoctoral Fellowship Program. Administered in much the same way as the other two, this program selects associates to conduct research in ocean and atmospheric sciences only. The aim is to recruit more scientists and engineers in these specialized areas.

- The American Society for Engineering Education also administers the Navy/ASEE Summer Faculty Research Program for university faculty members to work for ten weeks with professional peers in participating Navy laboratories on research of mutual interest.

- The NRL/United States Naval Academy (USNA) Cooperative Program for Scientific Interchange allows faculty members of the U.S. Naval Academy to participate in NRL research. This collaboration benefits the Academy by providing the opportunity for USNA faculty members to work on research of a more practical or applied nature. In turn, NRL's research program is strengthened by the available scientific and engineering expertise of the USNA faculty.

- The National Defense Science and Engineering Graduate Fellowship Program helps U.S.

citizens obtain advanced training in disciplines of science and engineering critical to the U.S. Navy. The three-year program awards fellowships to recent outstanding graduates to support their study and research leading to doctoral degrees in specified disciplines such as electrical engineering, computer sciences, material sciences, applied physics, and ocean engineering. Award recipients are encouraged to continue their study and research in a Navy laboratory during the summer.

For further information about these six programs, please contact Mrs. Lesley Renfro at (202) 404-7450.

- The Professional Development Program for Ensigns assigns newly commissioned Ensigns who are awaiting future training to NRL, working in areas of their own choosing commensurate with their academic qualifications. These young officers provide a fruitful summer of research assistance, while gaining valuable experience in the Navy's R&D program.

For more information, contact the Military Administrative Office, LT Paul Simmons at (202) 767-7511.

## Professional Appointments

- Faculty Member Appointments use the special skills and abilities of faculty members for short periods to fill positions of a scientific, engineering, professional, or analytical nature.

- Consultants and experts are employed because they are outstanding in their fields of specialization, or because they possess ability of a rare nature and could not normally be employed as regular civil servants.

- Intergovernmental Personnel Act Appointments temporarily assign personnel from the state or local government or educational institution to the federal government (or vice versa) to improve public services rendered by all levels of government.

## **High School/Undergraduate/Graduate College Student Programs**

The student programs are tailored to the undergraduate and graduate students to provide employment opportunities and work experience in naval research. These programs are designed to attract applicants for student and full professional employment in fields such as engineering, physics, mathematics, and computer science. The student employment programs are designed to help students and the educational institutions gain a better understanding of NRL's research, its challenges, and its opportunities. The employment programs for college students include the following:

- The **Student Career Experience Program** (formerly known as Cooperative Education Program) employs students in study-related occupations. The program is conducted in accordance with a planned schedule and a working agreement between NRL, the educational institution, and the student. Primary focus is on students pursuing bachelor degrees in engineering, computer science, or the physical sciences.
- The **Student Temporary Employment Program (STEP)** enables students to earn a salary while continuing their studies and offers them valuable work experience.
- The **Student Employment Program** employs students for the summer in paraprofessional and technician positions in engineering, physical sciences, computer sciences, and mathematics.

- The **Student Volunteer Program** helps students gain valuable experience by allowing them to voluntarily perform educationally related work at NRL.

For additional information on these undergraduate and graduate student programs, contact (202) 767-8313.

## **High School Programs**

- The **DoD Science & Engineering Apprentice Program (SEAP)** employs high school juniors and seniors to serve for eight weeks as junior research associates. Under the direction of a mentor, students gain a better understanding of research, its challenges, and its opportunities through participation in scientific programs. Criteria for eligibility are based on science and mathematics courses completed and grades achieved; scientific motivation, curiosity, and capacity for sustained hard work; a desire for a technical career; teacher recommendations; and achievement test scores. The NRL program is the lead program and the largest in DoD.

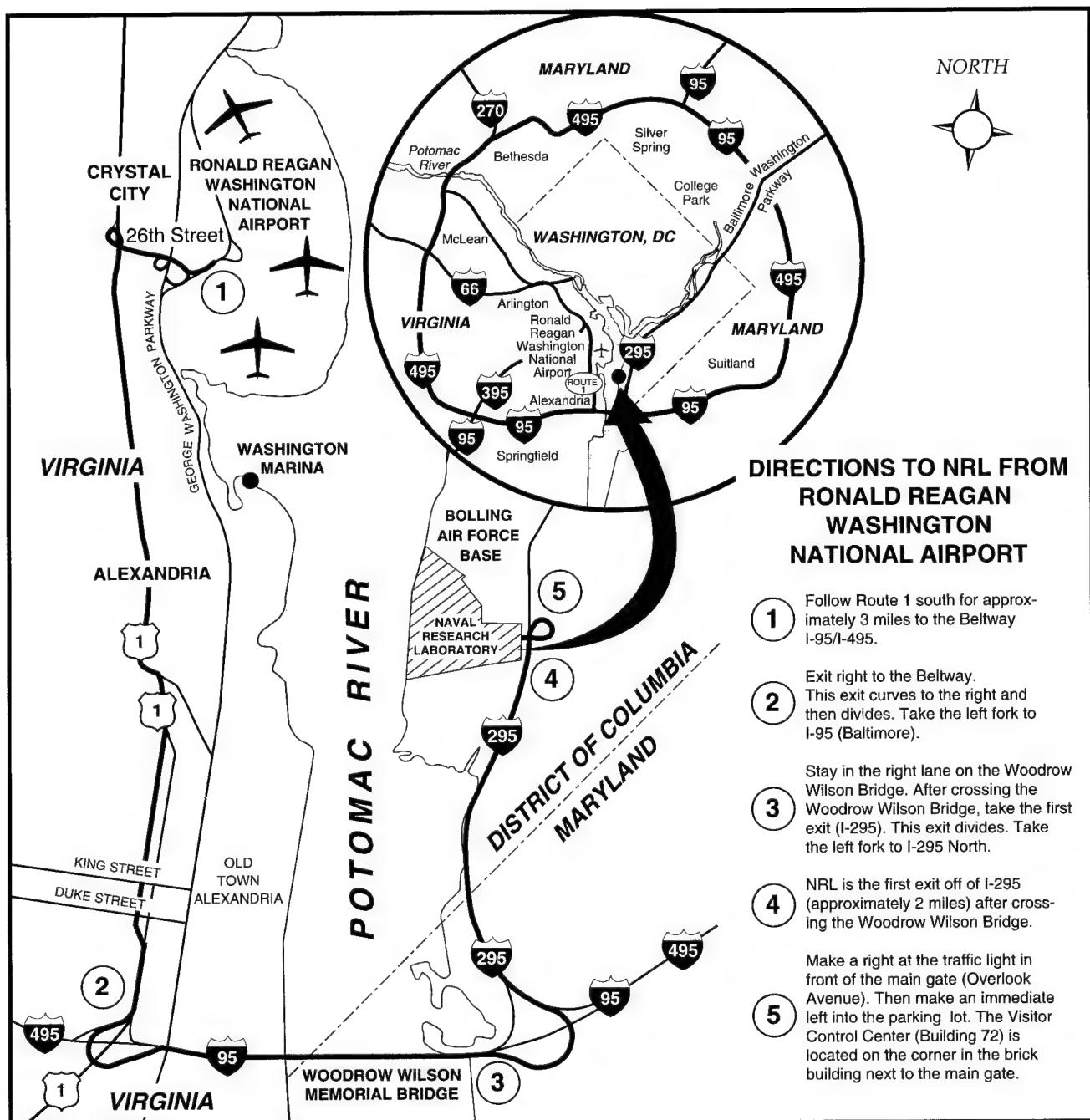
Prospective mentors desiring additional information on this program, please contact Dawn Brown at (202) 767-2957.

Students desiring additional information on this program may call the George Washington University SEAP Coordinator's Office at (202) 994-2234.



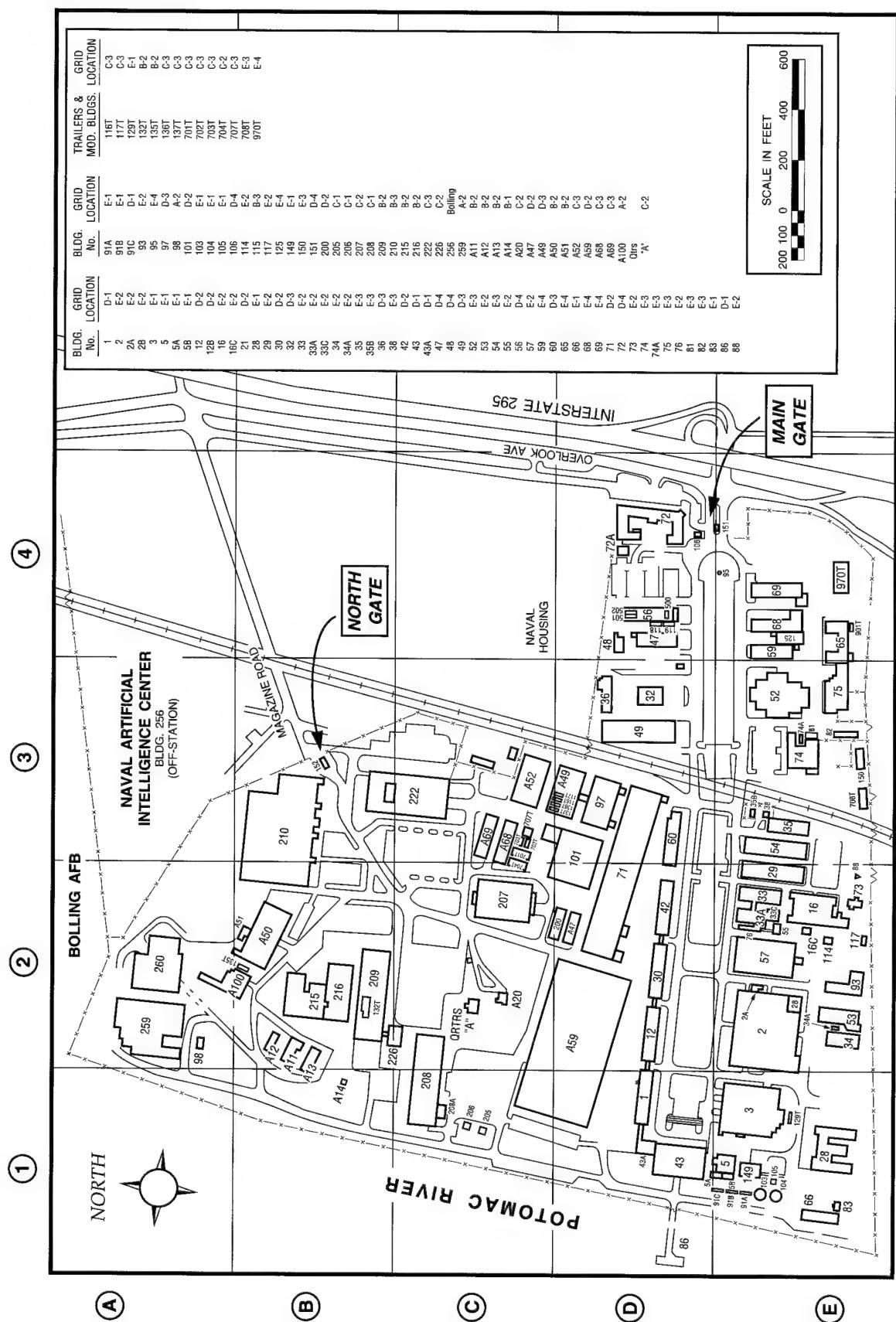
## **General Information**

# Naval Research Laboratory (Washington, DC)

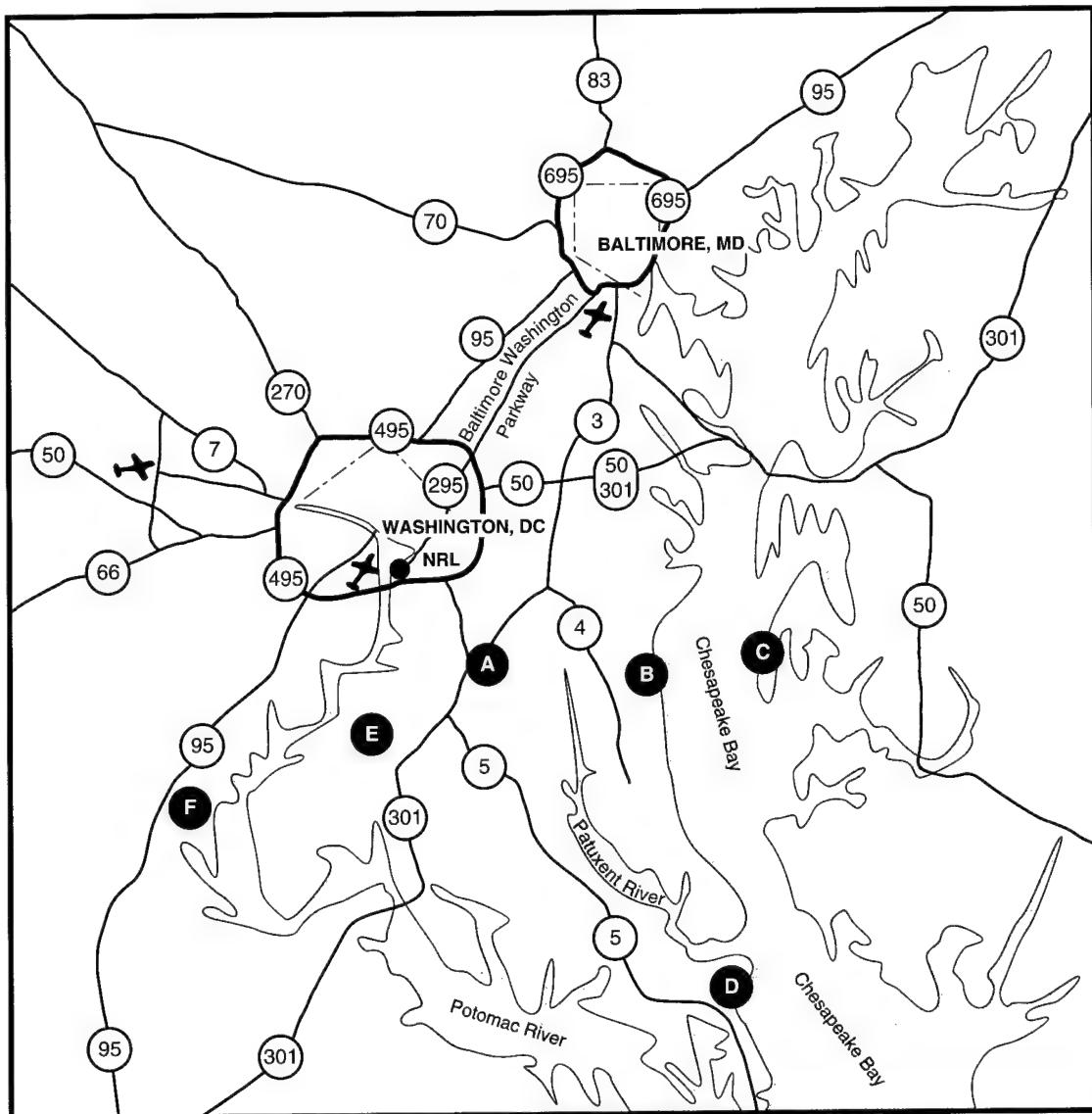


Naval Research Laboratory  
4555 Overlook Avenue, SW  
Washington, DC 20375-5320  
(202) 767-3200 – DSN 297-3200

# Location of Buildings at NRL Washington

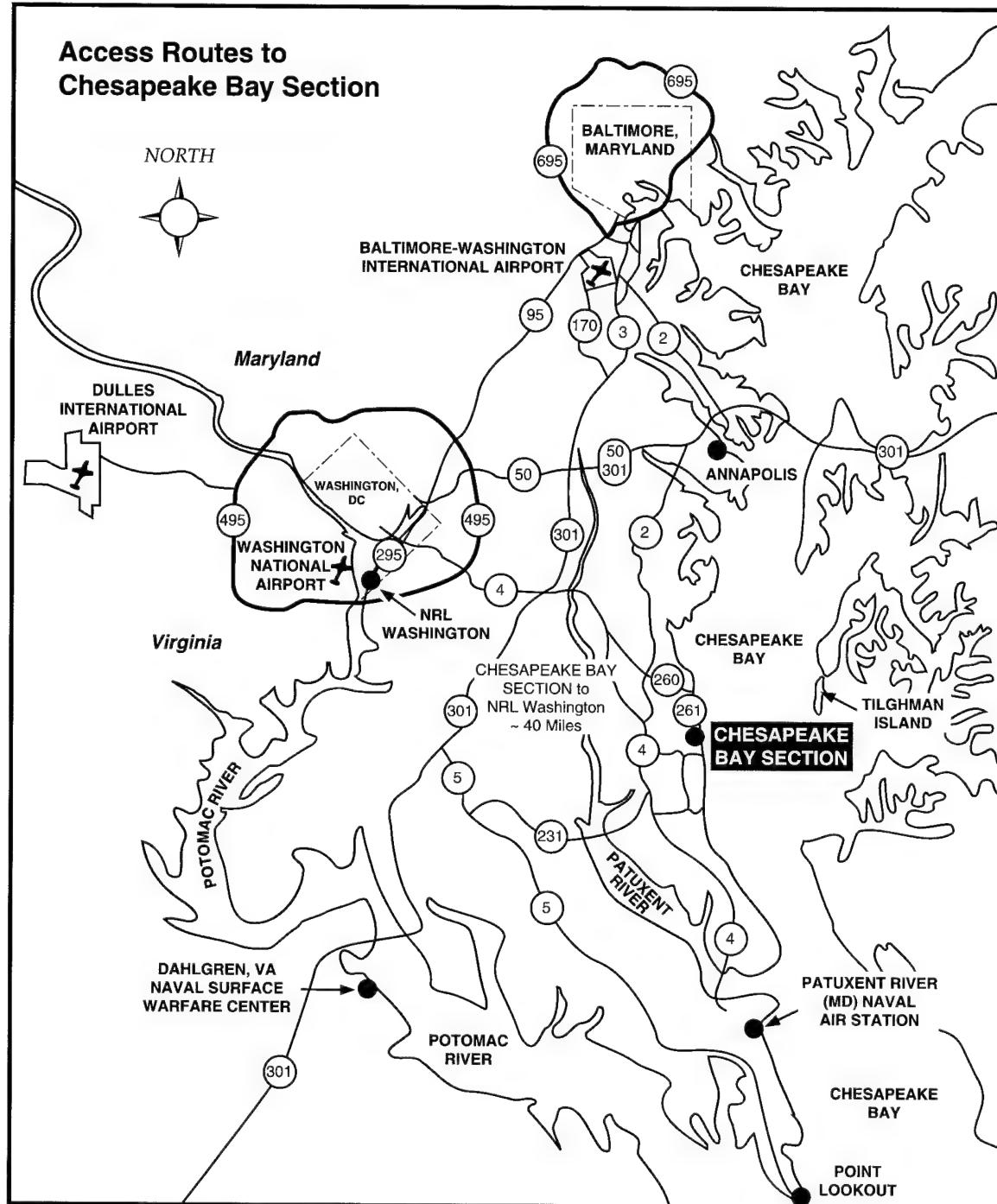


## Location of Field Sites in the NRL Washington Area



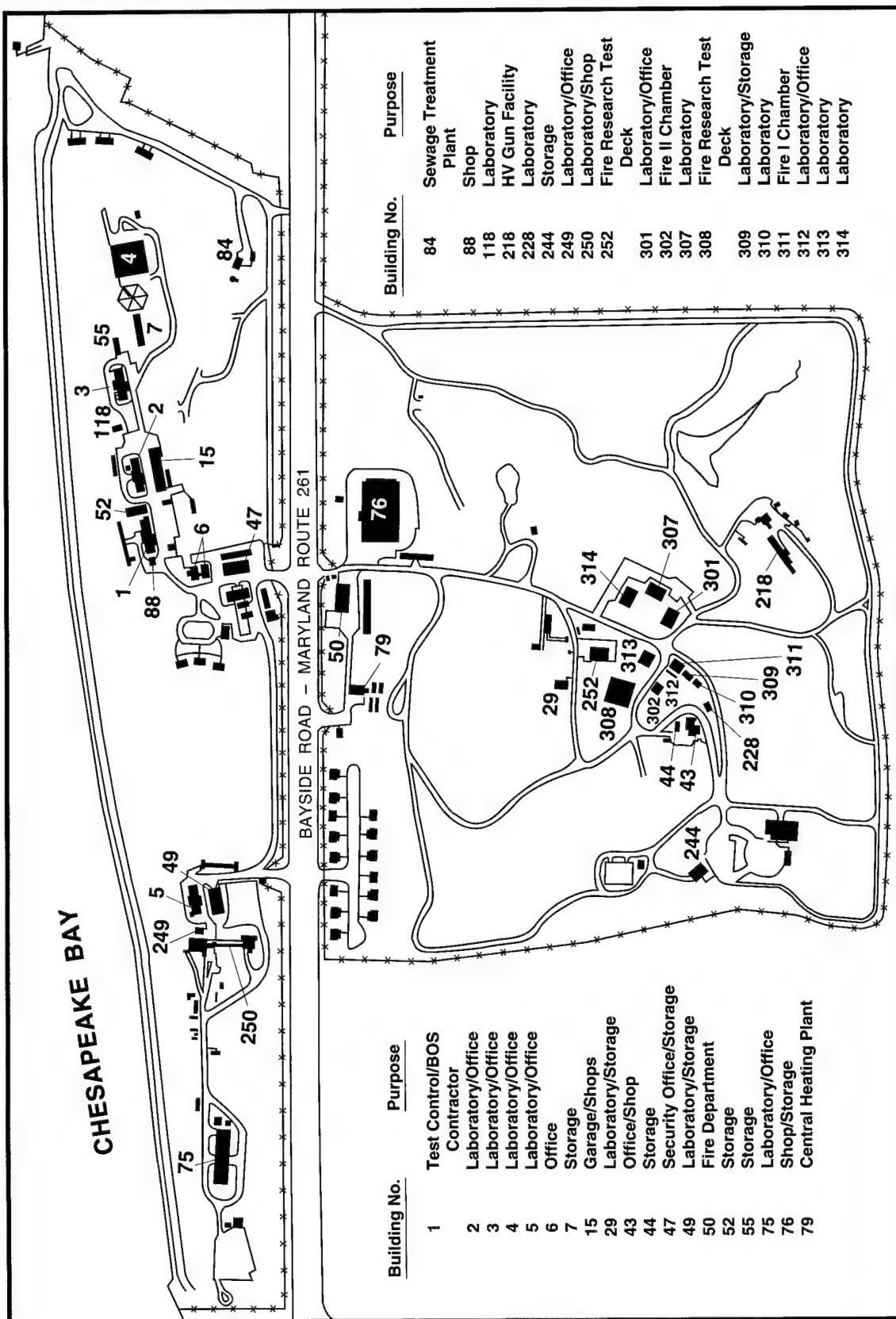
	<u>Location</u>	<u>Approximate Mileage from NRL Washington</u>	<u>Cognizant Code</u>
A	Brandywine, MD	28	5500
B	Chesapeake Bay Section, Chesapeake Beach, MD	40	3522
C	Tilghman Island, MD	110	3522
D	Patuxent River (MD) Naval Air Station	64	1600
E	Pomonkey, MD	20	8124
F	Midway Research Center, Quantico, VA	38	8140

# Chesapeake Bay Section (Chesapeake Beach, Maryland)

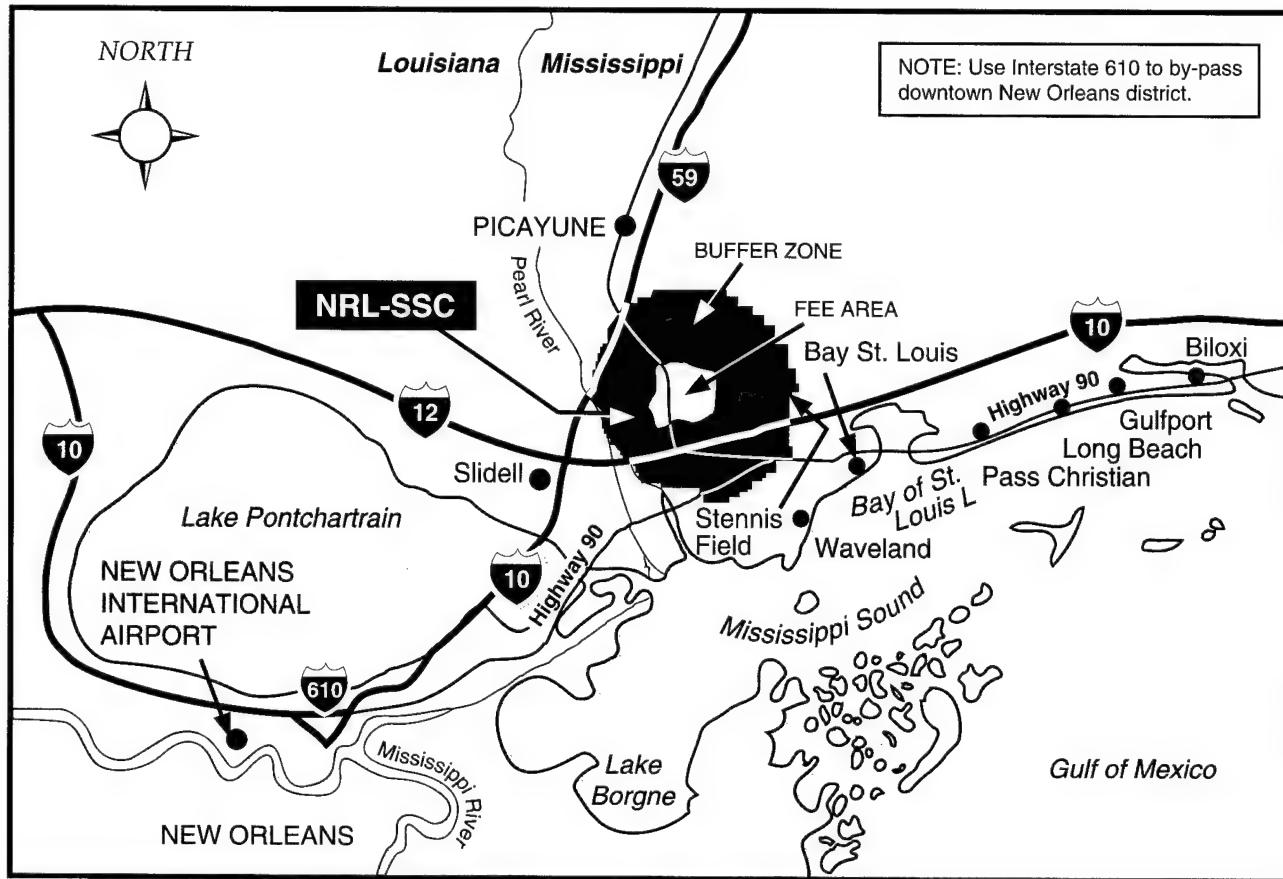


Naval Research Laboratory  
Chesapeake Bay Section  
5813 Bayside Road  
Chesapeake Beach, MD 20732  
(301) 257-4002

## Location of Buildings at the Chesapeake Bay Section

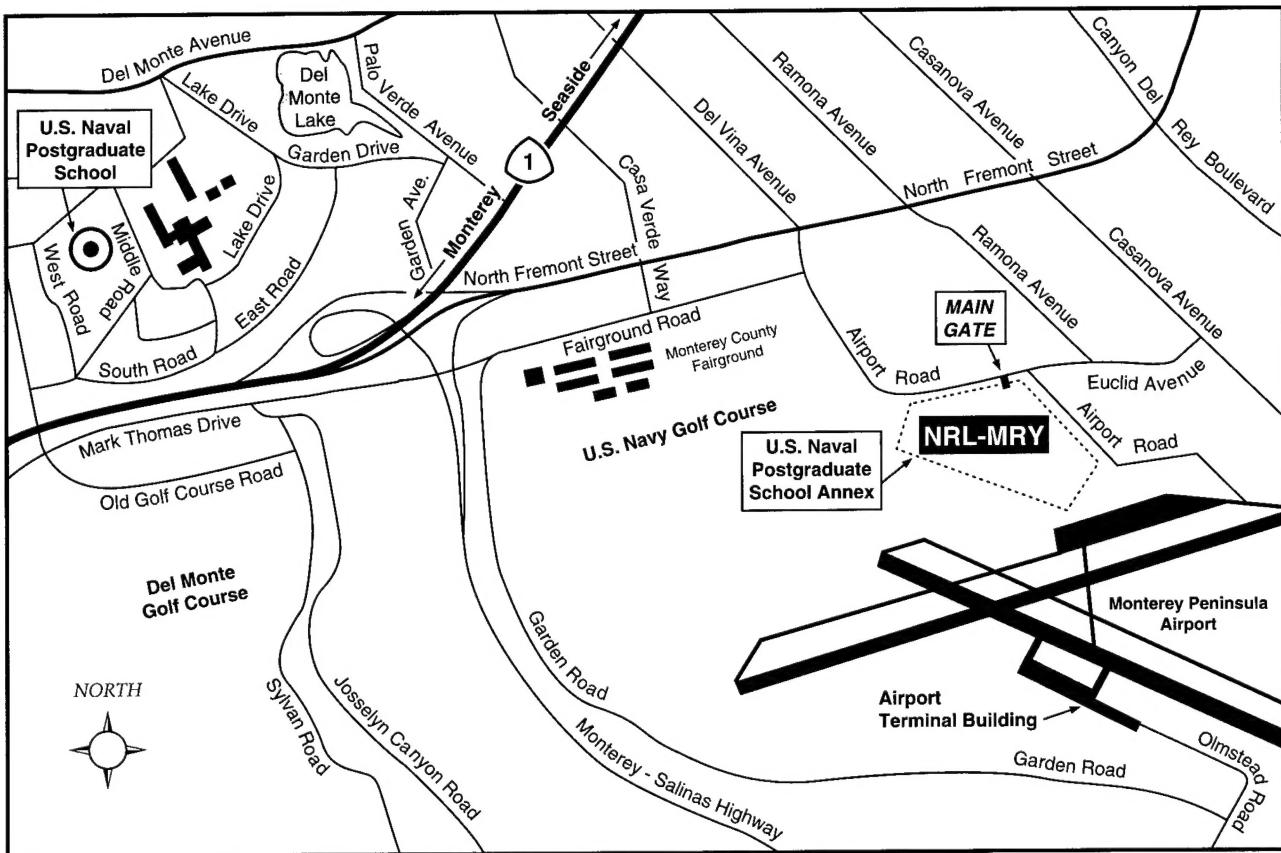


# John C. Stennis Space Center (Stennis Space Center, Mississippi)



Naval Research Laboratory  
John C. Stennis Space Center  
Stennis Space Center, MS 39529-5004  
(228) 688-3390

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A handwritten signature in black ink, appearing to read "D H Rau".

Douglas H. Rau, Captain, USN  
Commanding Officer